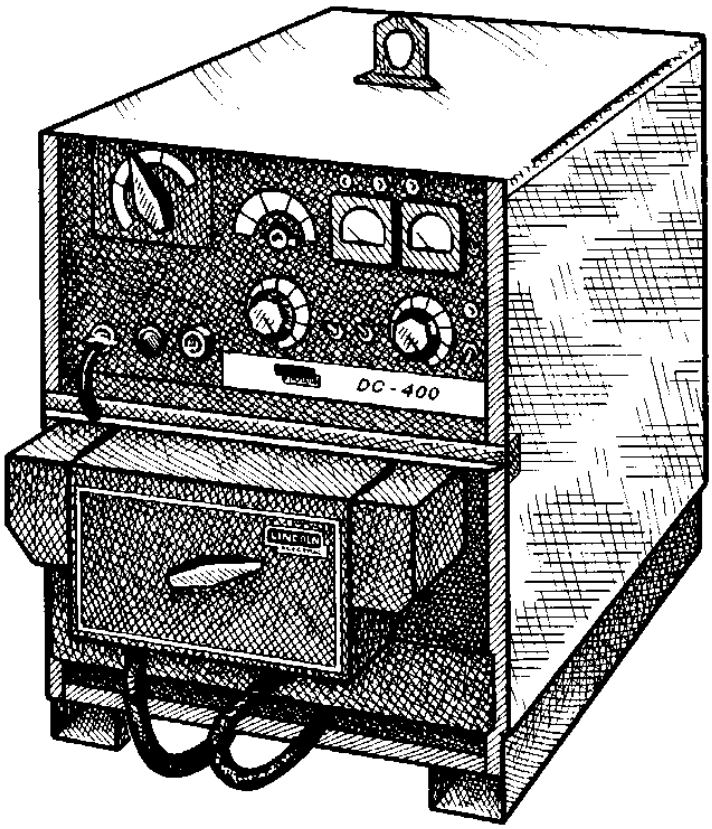
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info

RETURN TO MAIN INDEX

SVM 122-A
Oct. 1996

IDEALARC™ DC-400

For use with machine code numbers **9847, 9848** and **9850**



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

SERVICE MANUAL

LINCOLN® ELECTRIC

World's Leader in Welding and Cutting Products

Premier Manufacturer of Industrial Motors

Sales and Service through subsidiaries and Distributors Worldwide
22801 St. Clair Ave. Cleveland, Ohio 44117-1199 U.S.A. Tel. (216) 481-8100

SAFETY

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of “Safety in Welding & Cutting - ANSI Standard Z49.1” from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of “Arc Welding Safety” booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

LINCOLN ELECTRIC

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

SAFETY

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

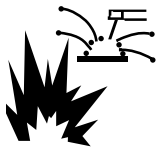
5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.d. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.e. Also see item 1.b.

SAFETY



WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

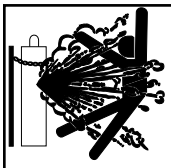
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.



CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:
   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enroule le câble-électrode autour de n'importe quelle partie du corps.
3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:
   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnementde l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laiter en fusion sont émises de l'arc de soudage. Se protéger avec es vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.
6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir ttout risque d'incendie dû étincelles.
7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de la faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou atres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opéerations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement roxique) ou autres produits irritants.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.
4. Garder tous les couvercles et dispostifis de sûreté à leur place.

MASTER TABLE OF CONTENTS FOR ALL SECTIONS

RETURN TO MAIN INDEX

Page

Safety ..... i-iv

Installation ..... **Section A**

Installation Section Table of Contents A-1
Technical Specifications A-2
Safety Precautions A-3
Select Suitable Location (Stacking, Tilting, Lifting) A-3
Input Connections A-4
Reconnect Procedure A-6
Output Connections A-7

Operation ..... **Section B**

Safety Instructions B-2
General Description B-3
Controls and Settings B-4
Welding Operation B-6
Overload Protection B-9
Auxiliary Power B-9

Accessories ..... **Section C**

Maintenance ..... **Section D**

Safety Precautions D-2
Routine and Periodic Maintenance D-2
General Component Locations D-3

Theory of Operation ..... **Section E**

Troubleshooting and Repair ..... **Section F**

How To Use Troubleshooting Guide F-2
Troubleshooting Guide F-4
Test Procedures F-15
Oscilloscope Waveforms F-33
Replacement Procedures F-40
Retest After Repair F-61

Electrical Diagrams ..... **Section G**

Parts Manual **P-234**

Section A-1

TABLE OF CONTENTS
- INSTALLATION SECTION -

Installation

Technical Specifications Idealarc DC-400 ..... A-2
Input and Output Specifications A-2
Cable and Fuse Sizes A-2
Physical Dimensions A-2
Safety Precautions A-3
Select Suitable Location A-3
Lifting A-3
Tilting A-3
Stacking A-3
Input Connections A-4
Ground Connection A-4
Input Supply Connections A-4
Input Wire and Fuse Size A-5
Reconnect Procedure A-6
Output Connections A-7
Wire Feeder Connections A-8
Connections for Stick, TIG, Air/carbon Arc Operations A-8

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TECHNICAL SPECIFICATIONS - IDEALARC DC-400

INPUT - THREE PHASE ONLY

Standard Voltage	Input Current @ Rated Output
208V	87A
230V	78A
460V	39A
575V	32A

RATED OUTPUT

Duty Cycle	Amps	Volts at Rated Amps
100%	400	36
60%	450	38
50%	500	40

OUTPUT

Mode	Current Range	Maximum Open Circuit Voltage	Auxiliary Power
Constant Current	60 to 500 Amps	57 VDC	115 VAC, 10 Amps
Constant Voltage	60 to 500 Amps	45.5 VDC	42 VAC, 10 Amps

RECOMMENDED INPUT WIRE AND FUSE SIZES

Input Voltage / Frequency Volts/Hz	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Input Wire Size Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Ground Wire Size Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
208/60	125	87	4 (21 mm^2)	6 (13 mm^2)
230/60	125	78	4 (21 mm^2)	6 (13 mm^2)
460/60	60	39	8 (8.4 mm^2)	10 (5.3 mm^2)
220/50/60	125	81	4 (21 mm^2)	6 (13 mm^2)
230/50/60	125	77	4 (21 mm^2)	6 (13 mm^2)
380/50/60	70	47	8 (8.4 mm^2)	8 (8.4 mm^2)
400/50/60	70	44	8 (8.4 mm^2)	8 (8.4 mm^2)
440/50/60	60	41	8 (8.4 mm^2)	10 (5.3 mm^2)

PHYSICAL DIMENSIONS

Height	Width	Depth	Weight
30.75 in. (781 mm)	22.25 in. (565 mm)	32 in. (813 mm)	473 lbs. (215 kg)

INSTALLATION

Read this entire installation section before you start installation.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

Only qualified personnel should install, use, or service this equipment.

SELECT SUITABLE LOCATION

Place the Idealarc DC-400 where clean, cooling air can flow freely in through the front louvers and out through the rear louvers. Keep dust, dirt, and other foreign materials that can be drawn into the machine to a minimum. Failure to observe these precautions can lead to excessive operating temperatures and nuisance shut-downs.

LIFTING

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- Do not lift this machine using the lift bail if it is equipped with a heavy accessory such as a trailer or a gas cylinder.
- Lift only with equipment of adequate lifting capacity.
- Be sure the machine is stable when lifting.
- Do not stack more than three high.
- Do not stack the DC-400 on top of any other machine.

The Idealarc DC-400 weighs 473 pounds (215 kilograms). A permanent lift bail is located at the top of the machine, positioned at the center of gravity for stable lifting.

TILTING

Place the machine on a secure, level surface. Any surfaces you place it on other than the ground must be firm, non-skid, and structurally sound.

STACKING

Idealarc DC-400s may be stacked three high. The bottom machine must be on a stable, hard, level surface capable of supporting the weight of up to three machines (1419 pounds/645 kilograms). Be sure that the two pins in the roof of the bottom machine fit into the holes in the base of the machine above. The lift bail is positioned so that it fits without interference under the base of the second machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

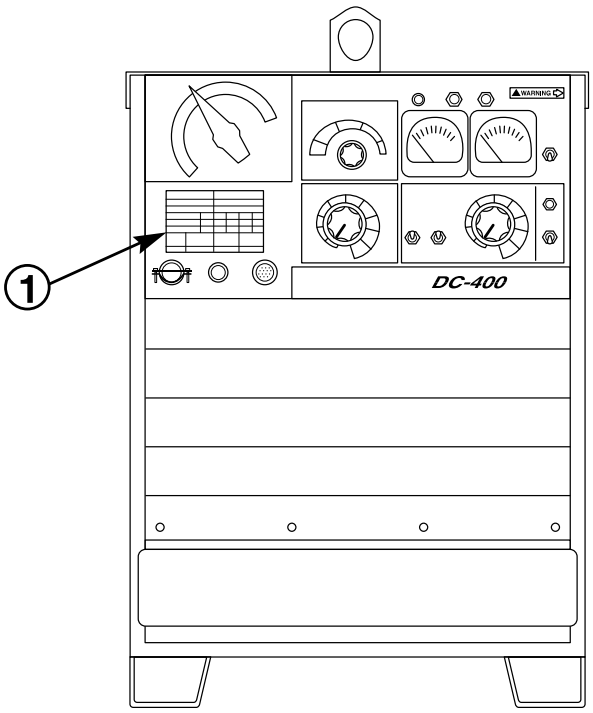
Return to Section TOC
Return to Master TOC

INPUT CONNECTIONS

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate, located on the case front control panel. See Figure A.1.

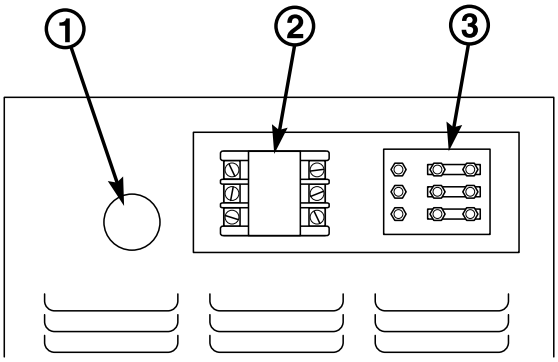
Input supply line entry is through a hole in the case rear top panel. A removable door covers the input connection box, which contains the input contactor (CR1) and reconnect panel assembly for multiple voltage machines. Input power is connected to the three line terminals on the input contactor. See Figure A.2.

FIGURE A.1 – RATING PLATE LOCATION



1. RATING PLATE

FIGURE A.2 – REAR PANEL



1. INPUT SUPPLY LINE ENTRY HOLE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

GROUND CONNECTION

The frame of the welder must be grounded. An earth grounding lead must be connected to the grounding terminal, marked on the input box floor with the symbol ( ).

INPUT SUPPLY CONNECTIONS

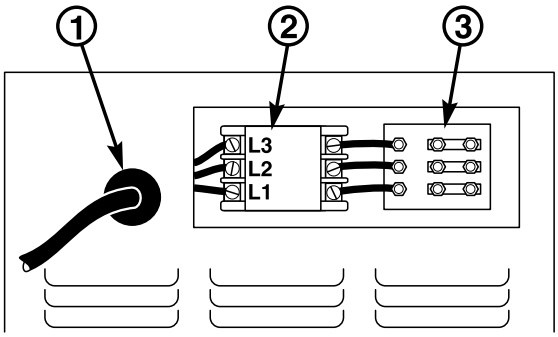
Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate.

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have a qualified electrician install and service this equipment.
- Turn the input power off at the fuse box before working on this equipment.
- Do not touch electrically hot parts.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

FIGURE A.3 – INPUT POWER SUPPLY CONNECTIONS



1. INPUT SUPPLY LINE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

Have a qualified electrician connect the input power leads to the L1, L2, and L3 terminals of the input contactor. Follow all national and local electrical codes. Use a three-phase line. Refer to the connection diagram located on the inside cover of the access panel cover. Also see Figure A.3.

INPUT WIRE AND FUSE SIZE

Fuse the input circuit with the super lag fuses recommended on the ***Technical Specifications page*** or use delay type circuit breakers. Choose an input and grounding wire size according to local or national codes; also see the ***Technical Specifications page***. Using fuses or circuit breakers smaller than recommended may result in "nuisance" shut-offs from welder inrush currents, even if you are not welding at high currents.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

RECONNECT PROCEDURE

Multiple input voltage welders are shipped connected for the highest voltage listed on the machine's rating plate. Before installing the welder, be sure the reconnect panel is connected for the proper voltage.

⚠ CAUTION

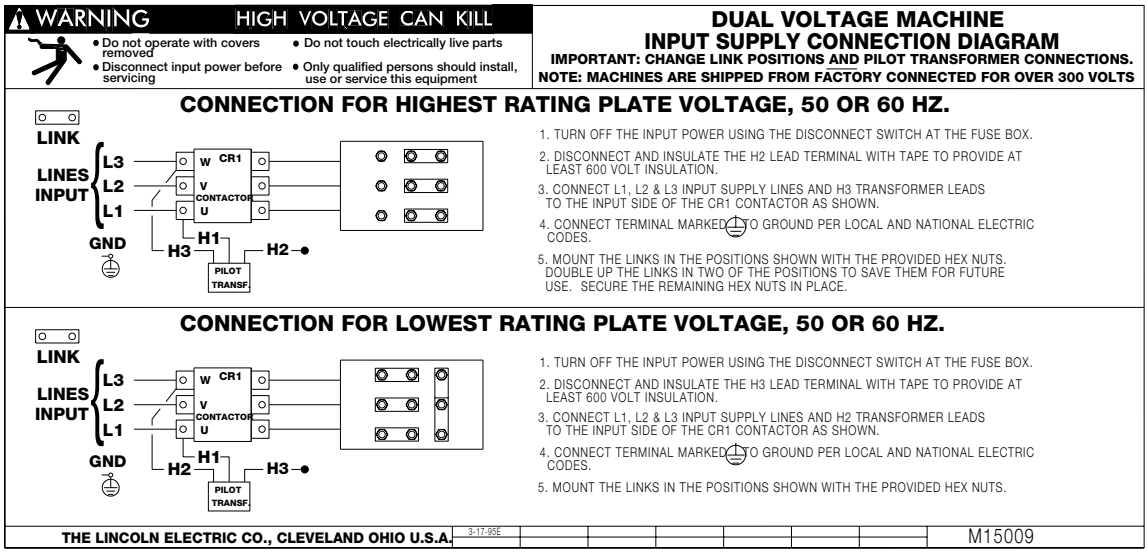
Failure to follow these instructions can cause immediate failure of components in the welder.

To reconnect a multiple voltage machine to a different voltage, remove input power. Follow the input connection diagram, located on the inside access panel cover, appropriate for your machine's input voltage. These same connection diagrams are shown below.

For 208, 208/230 & 230/460 volts AC - see Figure A.4.

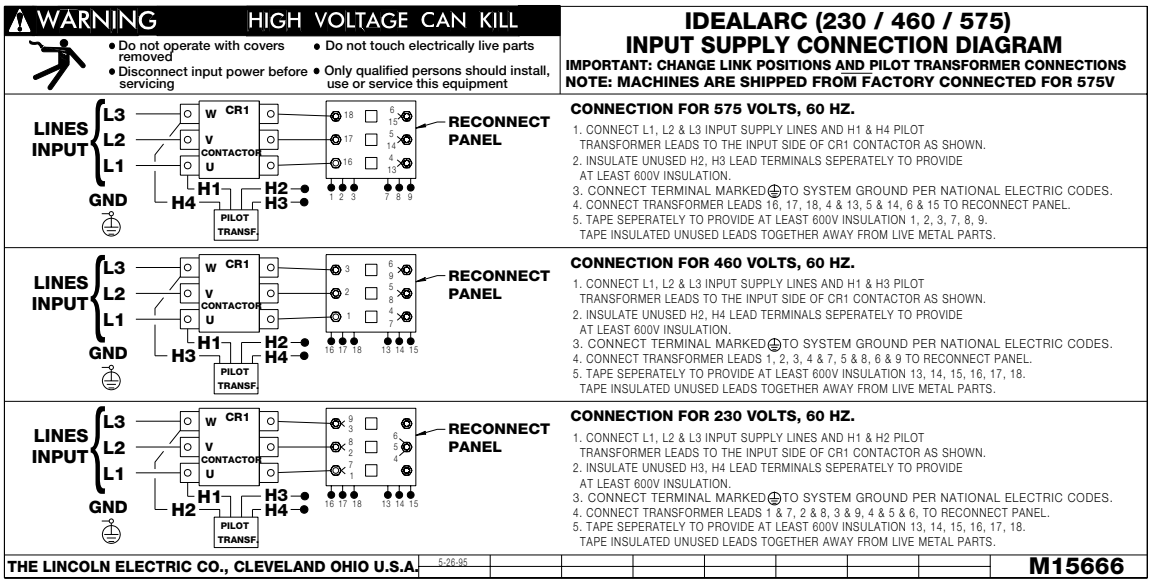
For 230/460/575 volts AC - see Figure A.5.

FIGURE A.4 - INPUT CONNECTION DIAGRAM FOR 208, 208/230 and 230/460 VOLTS AC, 50/60 HZ


WARNING HIGH VOLTAGE CAN KILL
• Do not operate with covers removed
• Disconnect input power before servicing
• Do not touch electrically live parts
• Only qualified persons should install, use or service this equipment
DUAL VOLTAGE MACHINE
INPUT SUPPLY CONNECTION DIAGRAM
IMPORTANT: CHANGE LINK POSITIONS AND PILOT TRANSFORMER CONNECTIONS.
NOTE: MACHINES ARE SHIPPED FROM FACTORY CONNECTED FOR OVER 300 VOLTS
CONNECTION FOR HIGHEST RATING PLATE VOLTAGE, 50 OR 60 HZ.
LINK
LINES INPUT
L3
L2
L1
GND
W
V
U
CR1
CONTACTOR
H1
H2
H3
PILOT TRANSF
1. TURN OFF THE INPUT POWER USING THE DISCONNECT SWITCH AT THE FUSE BOX.
2. DISCONNECT AND INSULATE THE H2 LEAD TERMINAL WITH TAPE TO PROVIDE AT LEAST 600 VOLT INSULATION.
3. CONNECT L1, L2 & L3 INPUT SUPPLY LINES AND H3 TRANSFORMER LEADS TO THE INPUT SIDE OF THE CR1 CONTACTOR AS SHOWN.
4. CONNECT TERMINAL MARKED TO GROUND PER LOCAL AND NATIONAL ELECTRIC CODES.
5. MOUNT THE LINKS IN THE POSITIONS SHOWN WITH THE PROVIDED HEX NUTS. DOUBLE UP THE LINKS IN TWO OF THE POSITIONS TO SAVE THEM FOR FUTURE USE. SECURE THE REMAINING HEX NUTS IN PLACE.
CONNECTION FOR LOWEST RATING PLATE VOLTAGE, 50 OR 60 HZ.
LINK
LINES INPUT
L3
L2
L1
GND
W
V
U
CR1
CONTACTOR
H1
H2
H3
PILOT TRANSF
1. TURN OFF THE INPUT POWER USING THE DISCONNECT SWITCH AT THE FUSE BOX.
2. DISCONNECT AND INSULATE THE H3 LEAD TERMINAL WITH TAPE TO PROVIDE AT LEAST 600 VOLT INSULATION.
3. CONNECT L1, L2 & L3 INPUT SUPPLY LINES AND H2 TRANSFORMER LEADS TO THE INPUT SIDE OF THE CR1 CONTACTOR AS SHOWN.
4. CONNECT TERMINAL MARKED TO GROUND PER LOCAL AND NATIONAL ELECTRIC CODES.
5. MOUNT THE LINKS IN THE POSITIONS SHOWN WITH THE PROVIDED HEX NUTS.
THE LINCOLN ELECTRIC CO., CLEVELAND OHIO U.S.A.
3-17-95E
M15009

Return to Section TOC
Return to Master TOC

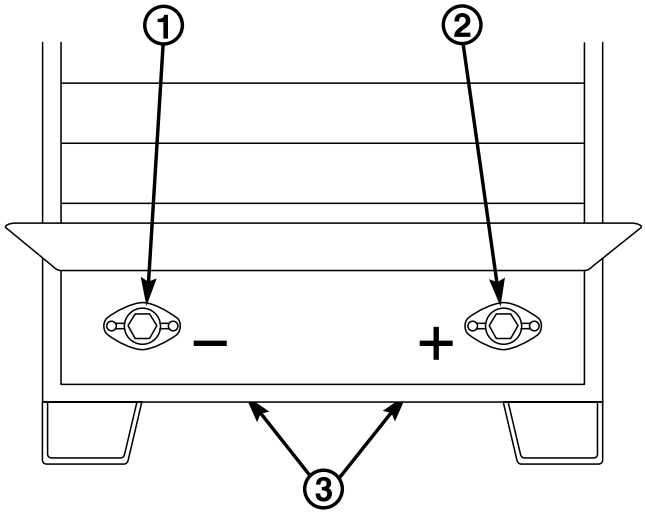
FIGURE A.5 - INPUT CONNECTION DIAGRAM FOR 230/460/575 VOLTS AC, 60 HZ


WARNING HIGH VOLTAGE CAN KILL
• Do not operate with covers removed
• Disconnect input power before servicing
• Do not touch electrically live parts
• Only qualified persons should install, use or service this equipment
IDEALARC (230 / 460 / 575)
INPUT SUPPLY CONNECTION DIAGRAM
IMPORTANT: CHANGE LINK POSITIONS AND PILOT TRANSFORMER CONNECTIONS
NOTE: MACHINES ARE SHIPPED FROM FACTORY CONNECTED FOR 575V
LINES INPUT
L3
L2
L1
GND
CR1
CONTACTOR
PILOT TRANSF.
RECONNECT PANEL
CONNECTION FOR 575 VOLTS, 60 HZ.
1. CONNECT L1, L2 & L3 INPUT SUPPLY LINES AND H1 & H4 PILOT TRANSFORMER LEADS TO THE INPUT SIDE OF CR1 CONTACTOR AS SHOWN.
2. INSULATE UNUSED H2, H3 LEAD TERMINALS SEPERATELY TO PROVIDE AT LEAST 600V INSULATION.
3. CONNECT TERMINAL MARKED ⏚ TO SYSTEM GROUND PER NATIONAL ELECTRIC CODES.
4. CONNECT TRANSFORMER LEADS 16, 17, 18, 4 & 13, 5 & 14, 6 & 15 TO RECONNECT PANEL.
5. TAPE SEPERATELY TO PROVIDE AT LEAST 600V INSULATION 1, 2, 3, 7, 8, 9. TAPE INSULATED UNUSED LEADS TOGETHER AWAY FROM LIVE METAL PARTS.
CONNECTION FOR 460 VOLTS, 60 HZ.
1. CONNECT L1, L2 & L3 INPUT SUPPLY LINES AND H1 & H3 PILOT TRANSFORMER LEADS TO THE INPUT SIDE OF CR1 CONTACTOR AS SHOWN.
2. INSULATE UNUSED H2, H4 LEAD TERMINALS SEPERATELY TO PROVIDE AT LEAST 600V INSULATION.
3. CONNECT TERMINAL MARKED ⏚ TO SYSTEM GROUND PER NATIONAL ELECTRIC CODES.
4. CONNECT TRANSFORMER LEADS 1, 2, 3, 4 & 7, 5 & 8, 6 & 9 TO RECONNECT PANEL.
5. TAPE SEPERATELY TO PROVIDE AT LEAST 600V INSULATION 13, 14, 15, 16, 17, 18. TAPE INSULATED UNUSED LEADS TOGETHER AWAY FROM LIVE METAL PARTS.
CONNECTION FOR 230 VOLTS, 60 HZ.
1. CONNECT L1, L2 & L3 INPUT SUPPLY LINES AND H1 & H2 PILOT TRANSFORMER LEADS TO THE INPUT SIDE OF CR1 CONTACTOR AS SHOWN.
2. INSULATE UNUSED H3, H4 LEAD TERMINALS SEPERATELY TO PROVIDE AT LEAST 600V INSULATION.
3. CONNECT TERMINAL MARKED ⏚ TO SYSTEM GROUND PER NATIONAL ELECTRIC CODES.
4. CONNECT TRANSFORMER LEADS 1 & 7, 2 & 8, 3 & 9, 4 & 5 & 6, TO RECONNECT PANEL.
5. TAPE SEPERATELY TO PROVIDE AT LEAST 600V INSULATION 13, 14, 15, 16, 17, 18. TAPE INSULATED UNUSED LEADS TOGETHER AWAY FROM LIVE METAL PARTS.
THE LINCOLN ELECTRIC CO., CLEVELAND OHIO U.S.A.
5-26-95
M15666

OUTPUT CONNECTIONS

The output (welding) cables are connected to the output terminals marked "+" and "-". See Table A.1 for recommended cable sizes for the combined lengths of electrode and work cables. They are located at the lower right and lower left corners of the front panel. Strain relief for the cables is provided by routing them through the rectangular holes in the base before connecting them to the output terminals. Lift the output terminal cover to access the output terminals. Lower the cover after making the connections. See Figure A.6.

FIGURE A.6 - OUTPUT TERMINAL CONNECTIONS



1. NEGATIVE (-) WELDING CABLE CONNECTION
2. POSITIVE (+) WELDING CABLE CONNECTION
3. CABLE STRAIN RELIEF HOLE LOCATION

Return to Section TOC
Return to Master TOC

TABLE A.1 - CABLE SIZES FOR COMBINED LENGTHS OF COPPER ELECTRODE AND WORK CABLES

Machine Size	Up to 50 ft (15 m)	50 - 100 ft (15 - 30 m)	100 - 150 ft (30 - 46 m)	150 - 200 ft (46 - 61 m)	200 - 250 ft (67 - 76 m)
400 Amp (100% Duty Cycle)	3/0 85 mm^2	3/0 85 mm^2	3/0 85 mm^2	3/0 85 mm^2	4/0 107 mm^2
500 Amp (50% Duty Cycle)	2/0 67 mm^2	2/0 67 mm^2	3/0 85 mm^2	3/0 85 mm^2	4/0 107 mm^2

WIRE FEEDER CONNECTIONS

See the ***Accessories*** section of this manual for specific instructions on connecting the following semi-automatic and automatic wire feeders to the Idealarc DC-400:

Automatic Wire Feeders:

- NA-3
- NA-5

Semi-automatic Wire Feeders:

- LN-7
- LN-8
- LN-9
- LN-25
- LN-742

CONNECTIONS FOR STICK, TIG, OR AIR/CARBON ARC CUTTING OPERATIONS

⚠ WARNING

The output terminals are energized at all times when the Idealarc DC-400 is used for stick, TIG, or air/carbon arc cutting.

The work and electrode cables for stick, TIG, or air/carbon arc cutting are connected as described earlier, under the heading ***Output Connections.*** A TIG torch is connected to the electrode (+) terminal of the welder. Select cable size according to Table A.1.

⚠ WARNING

Do not connect a TIG torch and stick electrode cable at the same time. They will both be electrically HOT.

If the Idealarc DC-400 is already set up for wire feeder operation, all wire feeder unit control, electrode, and work cables must be disconnected first before you can connect the cables for stick, TIG, or air/carbon arc operation.

However, the Idealarc DC-400 can be used for both wire feeder operation and stick, TIG, air/carbon arc operation if a K804-1 Multiprocess Switch is used. See the ***Accessories*** section of this manual for specific instructions on connecting and using the Multiprocess Switch.

96OCT

Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC

- OPERATION SECTION -

Operation ..... **Section B**
Safety Instructions B-2
General Description B-3
Recommended Processes B-3
Operational Features and Controls B-3
Design Features and Advantages B-3
Welding Capability B-3
Limitations B-3
Controls and Settings B-4
Welding Operation B-6
Operating Steps B-6
Local Control B-6
Remote Control B-6
Welding Procedure Recommendations B-6
Semiautomatic and Automatic Wire Feeding with an Idealarc DC-400 ..... B-6
NA-3 Automatic Wire Feeder B-7
Good Arc Striking Guidelines for the NA-3 ..... B-7
Arc Striking with the NA-3 Start Board B-7
NA-5 Automatic Wire Feeder B-8
LN-8 Semiautomatic Wire Feeder B-8
LN-7 and LN-9 Semiautomatic Wire Feeders B-9
Overload Protection B-9
Auxiliary Power B-9

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OPERATING INSTRUCTIONS

Read and understand this entire section of operating instructions before operating the machine.

SAFETY INSTRUCTIONS

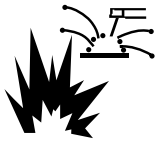
⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



WELDING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not weld on containers that have held combustibles.

ARC RAYS can burn.

- Wear eye, ear, and body protection.

Observe additional Safety Guidelines detailed in the beginning of this manual.

OPERATION

GENERAL DESCRIPTION

The Idealarc DC-400 is an SCR controlled three-phase input, DC output power source for welding and cutting. It uses a single range potentiometer control. The welder's unique combination of transformer, three-phase semiconverter rectifier, capacitor bank, arc control choke, and solid state control system deliver outstanding arc characteristics in the constant voltage mode. For stick welding, an Arc Force Control enables the Idealarc-400 to perform much like the R3R-500.

RECOMMENDED PROCESSES

The Idealarc DC-400 is recomended for all open arc processes including Innershield® and all solid wire and gas procedures within its capacity of 60 to 500 amps. It also can perform stick and TIG welding and air/carbon arc gouging up to 5/16" (8 mm) diameter. A mode switch on the front control panel selects CV (FCAW, GMAW), CV Submerged Arc, or CC (stick/TIG).

The Idealarc DC-400 can be connected to wire feeding equipment, including:

- Automatic wire feeders NA-3, NA-5, and NA-5R. (Requires the DC-400 Diode Kit option to use the cold start and cold electrode sensing features of these feeders.)
- Semi-automatic wire feeders LN-7, LN-7 GMA, LN-8, LN-9, LN-9 GMA, LN23P, LN-25, LN-742.
- Tractors LT-56, LT-7.

OPERATIONAL FEATURES AND CONTROLS

The following operational controls are standard on the Idealarc DC-400:

- Power Source Pilot Light
- ON/OFF Power Toggle Switch
- Output Control Potentiometer
- Output Control Switch (with Local or Remote positions)
- Output Terminals On or Remote Switch
- Arc Force Selector (for CC stick or TIG processes only)
- Auxiliary Power Connections for Wire Feeder and Other Equipment (115V and 42V)
- Mode Switch
- Arc Control
- Thermal Protection Indicator Light
- DC Ammeter
- DC Voltmeter
- Voltmeter "+" Electrode or "-" Electrode Switch

DESIGN FEATURES AND ADVANTAGES

- Input line voltage compensation keeps output constant for fluctuations of ± 10%.
- SCR control extends life of mechanical contactors.
- Hinged front control panel provides easy access to printed circuit boards and other control circuitry.
- Fully enclosed fan motor with permanently lubricated, sealed ball bearings needs no maintenance.
- Fully recessed control panel protects controls and minimizes accidental contact.
- Recessed output terminals and hinged terminal cover reduce chance of accidental contact.
- Low profile case permits installation under a workbench.
- Removable rear access panel provides easy access to input contactor and input lead connections.
- Removable case sides provide easy access for service or inspection, even when machines are stacked.
- Dripproof enclosure design permits outdoor operation.
- Double-dipped transformer, SCR bridge, and choke resist corrosion.

WELDING CAPABILITY

The Idealarc DC-400 has the following duty cycle ratings. If the duty cycle is exceeded, a thermal protector will shut off the machine output until it cools to normal operating temperature. The amber thermal protection indicator light will turn on until the machine cools.

Duty Cycle*	Amps	Volts
100%	400	36
60%	450	38
50%	500	40

*Based on a 10 minute time period. For example, a 60% duty cycle means 6 minutes on and 4 minutes off.

LIMITATIONS

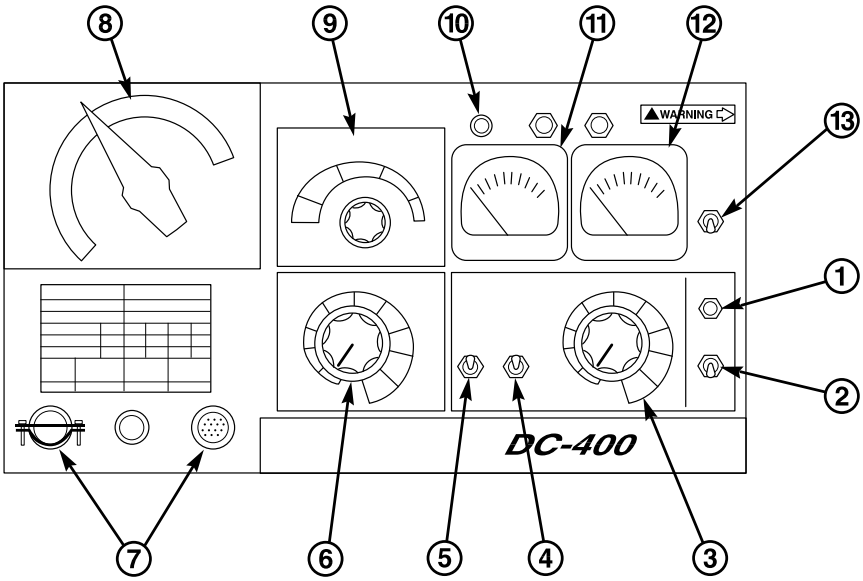
The Idealarc DC-400 has no provisions for paralleling.

Return to Section TOC
Return to Master TOC

CONTROLS AND SETTINGS

All operator controls and settings are located on the case front assembly. See Figure B.1 for their locations.

FIGURE B.1 – CASE FRONT CONTROLS



1. Power Source Pilot Light
2. ON/OFF Power Toggle Switch
3. Output Control Potentiometer
4. Output Control Switch (with Local or Remote positions)
5. Output Terminals Switch (with On or Remote positions)
6. Arc Force Selector (for CC stick or TIG processes only)
7. Auxiliary Power Connections for Wire Feeder and Other Equipment (115V and 42V)
8. Mode Switch
9. Arc Control
10. Thermal Protection Indicator Light
11. DC Ammeter
12. DC Voltmeter
13. Voltmeter "+" Electrode or "-" Electrode Switch

1. **POWER SOURCE PILOT LIGHT**: This light indicates that the power source input contactor is energized (closed). This also means that the main power transformer and all auxiliary control transformers are energized.
2. **ON/OFF POWER TOGGLE SWITCH:** Energizes or de-engergizes the input contactor which is powered by the 115 volt auxiliary transformer. The switch turns the machine ON or OFF. Position "I" is ON; position "0" is OFF.
3. **OUTPUT CONTROL POTENTIOMETER:** Controls voltage in CV mode and current in CC mode.
4. **OUTPUT CONTROL SWITCH (WITH LOCAL OR REMOTE POSITIONS)**: Selects the mode of control. In the "Local" position, control is by the machine control panel. In the "Remote" position, control is by either a wire feeder unit or through an optional remote control device.
5. **OUTPUT TERMINALS "ON" OR "REMOTE" SWITCH:** When in the "Remote" position, leads #2 and #4 have to be jumpered externally to energize the output terminals. When in the "ON" position, this switch internally jumpers leads #2 and #4, which energizes the output terminals.
6. **ARC FORCE SELECTOR:** Allows you to select the ideal arc force according to the procedure and electrode being used for CC stick or TIG welding. It controls the amount of current added to the welding current when the electrode shorts to the work. At minimum setting, no extra short circuit current is added. The arc will be softer and have less spatter but may be more prone to sticking. At maximum setting, the arc will be more forceful and less prone to sticking but will produce more spatter.

Return to Section TOC
Return to Master TOC

7. **AUXILIARY POWER AND REMOTE CONTROL CONNECTIONS FOR WIRE FEEDER AND OTHER EQUIPMENT (115V AND 42V):** The 14-pin amphenol receptacle provides either 115 or 42 volts AC as well as remote control connections. Terminal strips with screw connections are located behind the hinged control panel for hard wired control. Only 115 volts AC is available on the terminal strip. A strain relief connector is provided for cable entry.
8. **MODE SWITCH:** Selects between Constant Voltage FCAW/GMAW and Constant Voltage Submerged Arc (Red range on dial), and Constant Current Stick/TIG (Blue range on dial).
9. **ARC CONTROL:** A five-position switch that changes the pinch effect of the arc when in the CV FCAW/GMAW mode. It allows control of spatter, fluidity, and bead shape. The Arc Control is set to provide optimum welding depending on the process, position, and electrode. Pinch effect is increased by turning the control clockwise. It can also be adjusted while the machine is in operation.
10. **THERMAL PROTECTION INDICATOR LIGHT:** This amber light indicates that either of the two protective thermostats has opened. Output power is removed, but input power is still being applied to the machine.
11. **DC AMMETER:** Displays output current when welding.
12. **DC VOLTMETER:** Displays output voltage when welding.
13. **VOLTMETER "+" ELECTRODE OR "-" ELECTRODE SWITCH:** Selects the electrode polarity for the remote work sensing lead (#21) when using automatic or semiautomatic wire feeders.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

WELDING OPERATION

OPERATING STEPS

LOCAL CONTROL

The following procedures are for using the Idealarc DC-400 in the local control mode of operation. For remote control of the machine, see the REMOTE CONTROL section.

Before operating the machine, make sure you have all materials needed to complete the job. Be sure you are familiar with and have taken all possible safety precautions before starting work. It is important that you follow these operating steps each time you use the machine.

1. Turn on the main AC input power to the machine.
2. Set the VOLTMETER "+" or "-" switch to the appropriate position.
   - Set toggle to "Electrode Negative" position if the electrode is connected to the negative (-) output terminal.
   - Set toggle to "Electrode Positive" position if the electrode is connected to the positive (+) output terminal.
3. Set the welding MODE switch to welding process being used.
   - CV FCAW/GMAW
   - CV Submerged Arc
   - CC Stick/Tig
4. Set the OUTPUT CONTROL switch to "Local." (Exception: when using an LN-9, LN-9 GMA, or NA-5 wire feeder, set the switch to "Remote." Otherwise, the wire feeder may automatically shut down.
5. Set the OUTPUT TERMINALS switch to the desired mode.
6. Set the ARC FORCE CONTROL to midrange, 5-6. This control is for CC stick or TIG welding only. Adjust for best characteristics as necessary.
7. Set the ARC CONTROL to midrange, 3. This control is for CV FCAW/GMAW welding only. Adjust as necessary for best pinch control.
8. Set the ON/OFF POWER toggle switch to the ON position (1).
   - The power source pilot light glows.
   - The fan starts.
9. Set OUTPUT CONTROL potentiometer to desired voltage or current.
10. Make the weld.

REMOTE CONTROL

The toggle switch on the control panel labeled "Output Control Remote" gives you the option of controlling the machine output from a remote location. In the "Remote" position a wire feeder with remote control capabilities or a remote control device such as a K775 must be connected to the DC-400. Refer to the ***Accessories*** section for wire feeder installation information.

WELDING PROCEDURE RECOMMENDATIONS

Select Mode Switch position based on type of welding to be done.

1. FCAW/GMAW Welding/Other Open Arc Processes: Use the CV FCAW/GMAW mode.
2. Submerged Arc Welding: Use the CV Submerged Arc mode. If performing high speed welding, switch between the CV Submerged Arc and the CV FCAW/GMAW mode and use the mode that produces the best welding results.
3. Air/Carbon Arc Cutting / Stick Welding / High Current, Large Puddle Submerged Arc Welding: Use the CC mode. When the Idealarc DC-400 is used for Air/Carbon Arc cutting, the OUTPUT CONTROL potentiometer should be set to "9" initially. Based on the size of the carbon being used or the process, turn the potentiometer to a lower setting as required by the process. You can use carbon rods up to 5/16" (8 mm) in diameter at currents as high as 450 amps with excellent arc control. The welder protection circuit protects the machine from extremely high short circuiting pulses.

SEMIAUTOMATIC AND AUTOMATIC WIRE FEEDING WITH AN IDEALARC DC-400

When using the Idealarc DC-400 with semiautomatic or automatic wire feeding equipment and for stick welding or air/carbon arc cutting, it is recommended that the optional MULTIPROCESS switch be used. This switch permits you to easily change the polarity of the connected wire feeding equipment or switch to stick welding or air/carbon arc cutting.

Return to Section TOC
Return to Master TOC

NA-3 AUTOMATIC WIRE FEEDER

1. Set the DC-400 OUTPUT CONTROL switch to "Remote."

   NOTE: Later model NA-3 automatic wire feeders are capable of cold starts when the NA-3 Mode switch is in the CV or CC mode position. Some earlier models are capable of cold starting only in the CC mode position. Cold starting enables you to inch the wire down to the work, automatically stop, and automatically energize the flux hopper valve. The cold start feature requires the factory installed diode option. See the ***Accessories*** section.

2. Set the DC-400 welding MODE switch for the desired process: CV Submerged Arc, CV FCAW/GMAW mode or CC mode.
3. Set the NA-3 mode switch position to either CV or CC to match the DC-400 mode selected in step 2.
4. Set the OUTPUT CONTROL switch to "Remote."
5. Set the OUTPUT TERMINALS switch to "Remote."
6. For CC welding, set the ARC FORCE CONTROL to midrange, 5-6. After welding starts, adjust as necessary.
7. For CV FCAW/GMAW welding, set the ARC CONTROL to midrange, 3. After welding starts, adjust as necessary.
8. Refer to the NA-3 operator's manual for instructions on how to use the NA-3 in conjunction with the DC-400.
9. Follow the guidelines for good arc striking detailed below for each welding mode.

GOOD ARC STRIKING GUIDELINES FOR THE NA-3 WITH THE IDEALARC DC-400 IN THE CV FCAW/GMAW, CV SUBMERGED ARC OR STICK/TIG CC WELDING MODES.

Following are some basic arc striking techniques that apply to all wire feed processes. Using these procedures should provide trouble-free starting. These procedures apply to single, solid wires and Innershield wires.

1. Cut the electrode to a sharp point.
2. Set the NA-3 Open Circuit Voltage Control to the same dial setting as the Arc Voltage Control. If this is a new welding procedure, a good starting point is to set the Open Circuit Voltage Control to #6.

   NOTE: The open circuit voltage of the Idealarc DC-400 varies from apporximately 12 volts to 45 volts in the CV FCAW/GMAW or CV Submerged Arc modes. The open circuit voltage is constant in the CC mode.

3. Run a test weld. Set proper current, voltage, and travel speed.

   a. For the best starting performance, the NA-3 Open Circuit Voltage Control and Voltage Control setting should be the same. Set the Inch Speed Control for the slowest inch speed possible.

   b. To adjust the Open Circuit Voltage Control to get the best starting performance, make repeated starts observing the NA-3 voltmeter.

   When the voltmeter pointer swings smoothly up to the desired arc voltage, without undershooting or overshooting the desired arc voltage, the Open Circuit Voltage Control is set properly.

   If the voltmeter pointer overshoots the desired voltage and then returns to the desired voltage, the Open Circuit Voltage Control is set too high. This can result in a bad start where the wire tends to "blast off."

   If the voltmeter pointer hesitates before coming up to the desired voltage, the Open Circuit Voltage Control is set too low. This can cause the electrode to stub.

4. Start and make the weld.

   a. Cold starts. For cold starts, be sure the work piece is clean and the electrode makes positive contact with the work piece.

   b. Hot "On the Fly" starts. For hot starts, travel should begin before the wire contacts the work piece.

ARC STRIKING WITH THE NA-3 START BOARD

When electrical stickouts exceed 1-3/4" (44.4 mm) an NA-3 Start Board may be required to improve arc striking.

When the NA-3 Start Board is used to improve arc striking, use the following procedures:

1. Set start time at 0.
2. Set NA-3 start current and start voltage at midrange.
3. Set the NA-3 output current and voltage to the proper settings for the welding procedure to be used.

4. Turn the Start Board Timer to maximum.
5. Set Start Board current and voltage control.
   a. Set the Start Board current control to 1-1/2 dial numbers below that set on the NA-3 current control.
   b. Set the Start Board voltage control equal with the NA-3 voltage control setting.

   NOTE: These Start Board current and voltage settings result in a start up current that is lower than the NA-3 current setting and approximately equal with the NA-3 voltage setting for the desired welding procedure.
6. Establish the correct arc striking procedure with the NA-3 Start Board timer set at maximum.
   a. For the best starting performance, the NA-3 Open Circuit Voltage Control and Voltage Control setting should be the same. Set the Inch Speed Control for the slowest inch speed possible.
   b. To adjust the Open Circuit Voltage Control to get the best starting performance, make repeated starts observing the NA-3 voltmeter.

   When the voltmeter pointer swings smoothly up to the desired arc voltage, without undershooting or overshooting the desired arc voltage, the Open Circuit Voltage Control is set properly.

   If the voltmeter pointer overshoots the desired voltage and then returns to the desired voltage, the Open Circuit Voltage Control is set too high. This can result in a bad start where the wire tends to "blast off."

   If the voltmeter pointer hesitates before coming up to the desired voltage, the Open Circuit Voltage Control is set too low. This can cause the electrode to stub.
   c. Set NA-3 Start Board current and voltage as close to the welding procedure current and voltage as possible.

   NOTE: The Start Board current and voltage should be as close as possible to the welding procedure current and voltage, while still getting satisfactory starts.
   d. Set the start time to as low a time as possible while still getting satisfactory starts.
7. Start and make the weld.

NA-5 AUTOMATIVE WIRE FEEDER

When using the Idealarc DC-400 with the NA-5 wire feeder, set the controls on the Idealarc DC-400 as follows for the best performance:

1. Turn OFF main AC input power to the Idealarc DC-400.
2. Connect the electrode cables to the terminal polarity to be used.
3. Set the VOLTMETER "+" or "-" switch to the same polarity as the electrode cable connection.
4. Set the OUTPUT CONTROL switch to "Remote."
5. Set the OUTPUT TERMINALS switch to "Remote."
6. Set the Idealarc DC-400 welding MODE switch to the position that matches the welding process being used.
   a. For submerged arc welding, set welding MODE SWITCH TO CV SUBMERGED ARC position.
   b. For all open arc welding processes, set welding MODE switch TO CV FCAW/GMAW position.
7. Set the ARC CONTROL to midrange, 3. After welding starts, adjust as necessary.

LN-8 SEMIAUTOMATIC WIRE FEEDER

To use the LN-8 Semiautomatic Wire Feeder with the Idealarc DC-400:

1. Set the Idealarc DC-400 welding MODE switch to either CV FCAW/GMAW mode or CV Submerged Arc mode, depending on the welding process being used.
2. Set the Idealarc DC-400 OUTPUT CONTROL switch to "Remote."
3. Set the OUTPUT TERMINALS switch to "Remote."
4. Set the ARC CONTROL to midrange, 3.
5. Set the LN-8 Welding Mode switch to the CV position. The LN-8 Welding Mode switch is located on the variable voltage (CC) board.
6. Refer to the LN-8 Operator's Manual for instructions on how to use the LN-8.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

LN-7 AND LN-9 SEMIAUTOMATIC WIRE FEEDERS OR OTHER CONSTANT SPEED WIRE FEEDERS

To use the LN-7, LN-9, or other constant wire feed speed semiautomatic wire feeders with the Idealarc DC-400:

1. Set the Idealarc DC-400 welding MODE switch to either CV FCAW/GMAW mode or CV Submerged Arc mode, depending on the welding process being used.

   NOTE: These semiautomatic wire feeders cannot be used in the CC mode.

2. Set the Idealarc DC-400 OUTPUT CONTROL switch.

   a. LN-7: Use either an optional K775 Remote Control Box Assembly or set the Idealarc DC-400 OUTPUT CONTROL switch in the “Local” position.

   b. LN-9: Refer to the LN-9 Operator’s Manual for instructions on how to use the LN-9.

   c. LN-25: Refer to the LN-25 Operator’s Manual for instructions on how to use the LN-25.

   d. LN-742: Refer to the LN-742 Operator’s Manual for instructions on how to use the LN-742.

OVERLOAD PROTECTION

The power source is thermostatically protected with proximity thermostats against overloads or insufficient cooling. One thermostat is located on the nose of the center bottom primary coil. A second thermostat is attached to the lead connecting the secondaries. If the machine is overloaded, the primary thermostat opens, the output becomes zero, and the amber thermal protection light comes on. The fan will continue to run. The secondary thermostat opens with either an excessive overload or insufficient cooling. The output becomes zero, and the amber thermal protection light comes on. When the machine cools, the thermostats reset, and the thermal protection light goes off.

The power source is also protected against overloads on the SCR bridge asssembly through an electronic protection circuit. This circuit senses an overload on the power source and limits the output to 550 amps by phasing back the SCRs.

The Idealarc DC-400 also has self-restoring fusing to prevent damage to the machine in the event of an accidental grounding of the remote control leads (#75, #76 or #77).

AUXILIARY POWER

The Idealarc DC-400 can provide nominally 115 volt AC and 42 volt AC auxiliary power for operating wire feeding equipment and other accessories. This power is available at the 14-pin amphenol on the control panel and/or at the terminal strip behind the hinged control panel on the case front. On the amphenol, 115 volts AC is available at pins A and J (Domestic and Export models only); 42 volts AC is available at pins I and K. On the terminal strip, 115 volts AC is available at terminals 31 and 32; 42 volts AC is not available. The two circuits, 115 volts AC and 42 volts AC, are isolated; and each is protected by a 10 amp circuit breaker.

On European and export models, a Continental European receptacle is provided on the rear panel for supplying 220 volts AC to a water cooler. A 2 amp circuit breaker, also located on the rear panel, protects this circuit from overloads or short circuits.

TABLE OF CONTENTS
- ACCESSORIES -

Accessories.....**Section C**
Options/Accessories.....C-2
Factory Installed Option.....C-2
Field Installed Options.....C-2
Cover for 14-Pin Amphenol.....C-2
Multiprocess Switch (K804-1).....C-2
Remote Output Adapter Cable (K857).....C-4
Remote Control Adapter Cable (K864).....C-4
Amptrol Adapter Cable (K843).....C-4
Capacitor Discharge Circuit (K828-1).....C-6
Hi-Freq Kit (K799).....C-6
Amptrol Adapter for K799 (K915).....C-6
Undercarriages (K817, K817R, K841).....C-6
Connection of Lincoln Electric Automatic or Semiautomatic Wire Feeders.....C-6
Automatic Wire Feeders.....C-6
NA-3 (Terminal Strip).....C-6
NA-5 (Terminal Strip).....C-7
NA-3 or NA-5 (14-Pin Amphenol).....C-8
Semiautomatic Wire Feeders.....C-9
LN-7 (14-Pin Amphenol).....C-9
LN-7 (Terminal Strip).....C-10
LN-8 or LN-9 (Terminal Strip).....C-11
LN-8 or LN-9 (14-Pin Amphenol).....C-12
LN-742 (14-Pin Amphenol).....C-13

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

OPTIONS/ACCESSORIES

FACTORY INSTALLED OPTION

DIODE OPTION

This factory installed option allows use of the cold-start and cold electrode sensing features of the NA-3, NA-5, or NA-5R automatic wire feeders. See the topic, ***Connecting the NA-3 [NA-5] to the Idealarc DC-400*** in this section of the manual.

FIELD INSTALLED OPTIONS

The following options/accessories are available for your Idealarc DC-400 from your local Lincoln Distributor.

COVER FOR 14-PIN AMPHENOL (LINCOLN ELECTRIC PART NUMBER S17062-3)

Protects the amphenol from dirt and moisture when the amphenol is not being used.

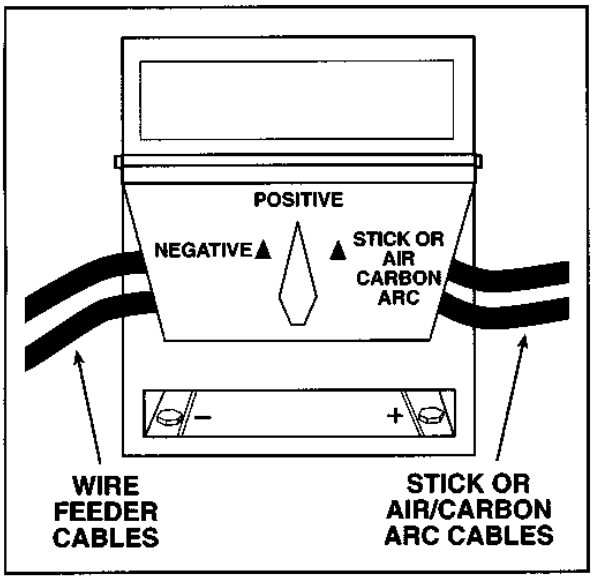
MULTIPROCESS SWITCH (K804-1. ALSO AVAILABLE AS A FACTORY INSTALLED OPTION.)

Required when using the DC-400 for both automatic/semiautomatic and stick/air carbon arc. This field or factory installed kit mounts on the front of the DC-400. It includes hinged covers over its output studs.

The switch has three positions.

- Wire Feeder Positive
- Wire Feeder Negative
- Stick/Air Carbon Arc

FIGURE C.1
MULTIPROCESS SWITCH



The Multiprocess Switch gives you the ability to:

- Switch between “Stick Welding/Air-Carbon Arc Cutting” or “Positive Wire Feeder” or “Negative Wire Feeder.”
- Change the polarity of a semi-automatic or automatic wire feeder without changing any electrical cable connections. See Figure C.1.

The Multiprocess Switch has two sets of output terminals. You connect the wire feeder unit cables to the set of terminals on the left side of the box (facing the front of the machine) and the stick or air/carbon arc cables to the set of terminals on the right side as shown in Figure C.1.

When the Multiprocess Switch is in the “Stick Welding/Air-Carbon Arc” position, only those terminals are energized. The wire feeder nozzle or gun and electrode are not electrically “hot” when in this mode.

Refer to installation instructions (M17137) included with Multiprocess Kit for installation.

Return to Section TOC
Return to Master TOC

Multiprocess Switch Operation

The operation of the Multiprocess Switch is as follows:

A semiautomatic or automatic wire feed unit electrode and work cables are connected to the terminals on the left side of the box. Stick or air carbon arc electrode and work cables are connected to the terminals on the switch. With the switch in the left position, the wire feed terminals are electrode negative. In the center position, the wire feeder terminals are electrode positive. In both the left and center switch position, the right side stick terminals are disconnected. In the right switch position, the wire feed terminals are disconnected from the DC-400 and the stick terminals connected. The polarity of the stick terminals is marked on the end of the box. To change polarity, the electrode and work cables must be interchanged. In the stick position, the stick terminals are energized at all times.

Connections

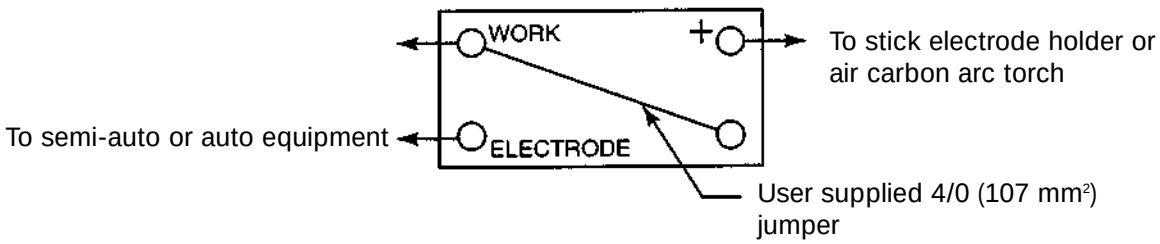
(For those applications where it is not necessary to have separate work cables for stick and semiautomatic welding.)

If both stick and semiautomatic welding is done on the same workpiece, only one work cable is required. To do this, connect a 4/0 (107 mm^2) jumper from the work terminal on the semiautomatic side to the terminal to be used for work on the stick side. The work cable from the semiautomatic side then serves as the work cable for both semiautomatic and stick welding. See Figure C.2.

To change stick polarity, reverse the leads at the (+) and (-) terminals on the right side of the Multiprocess Switch.

NOTE: When a DC-400 equipped with Multiprocess Switch is mounted on an undercarriage, the undercarriage handle in the resting position can hit the case of the Multiprocess Switch. This does no harm, but if the user desires, a 1/4” or 3/8” bolt and nut may be placed in the hole in the undercarriage tow bar to limit the travel of the undercarriage handle.

FIGURE C.2 – SINGLE WORK CABLE WITH JUMPER



Return to Section TOC
Return to Master TOC

ACCESSORIES

REMOTE OUTPUT CONTROL (K857 WITH K864 ADAPTER PLUG OR K775)

The K857 has a 6-pin MS-style connector. The K857 requires a K864 adapter cable which connects to the 14-pin connector on the machine.

An optional “remote output control” is available. This is the same remote control that is used on the Lincoln R3R and DC-600 power sources (K775). The K775 consists of a control box with 28 ft (8.5m) of four conductor cable. This connects to terminals 75, 76, and 77 on the terminal strip and the case grounding screw marked with the symbol on the machine. These terminals are located behind the control panel on the front. This device will give the same control as the output control on the machine.

REMOTE CONTROL ADAPTER CABLE (K864)

A “V” cable 12 inches (.30 m) long to connect a K857 Remote Control, K812 Hand Amptrol or K870 Foot Amptrol (6-pin connector) with a wire-feeder (14-pin connector) and the machine (14-pin connector). If a remote control or amptrol is used alone, the wire-feeder connection is not used. See Figure C.3.

AMPTROL™ ADAPTER CABLE (K843)

A five wire cable, 12 inches (.30 m) long, is available for easy connection of standard K812 Hand Amptrol or K870 Foot Amptrol. The cable has a 6-pin MS-style connector which connects to the Amptrol, and terminals which connect to 75, 76 and 77 on the machine terminal strip and to the case grounding screw. The Amptrol will control the same range of output as the current control on the welder. (If a smaller range of control is desired for finer adjustment, a K775 Remote may be used in conjunction with the Amptrol Adapter Cable Kit. Connection information is included with the Amptrol Adapter Cable Kit.) The Amptrol arc start switch does not function in this application.

K843 AMPTROL™ ADAPTER INSTALLATION INSTRUCTIONS

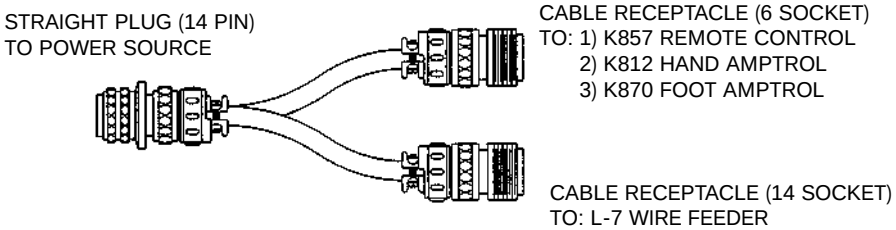
⚠ WARNING

ELECTRIC SHOCK can kill.

- Turn the input supply power OFF before installing plugs or cables or when connecting or disconnecting plugs to the welder.

This K843 adapter is used to connect Amptrol (K812, K813 or K870), remote control (K775), and Hi-Freq™ (K799) accessories to the DC-400. The OUTPUT CONTROL switch must be in “Remote” for Amptrol™ to control current. Accessories may be combined and connected in four different ways, as shown on the following page.

FIGURE C.3 – REMOTE CONTROL ADAPTER CABLE (K864)

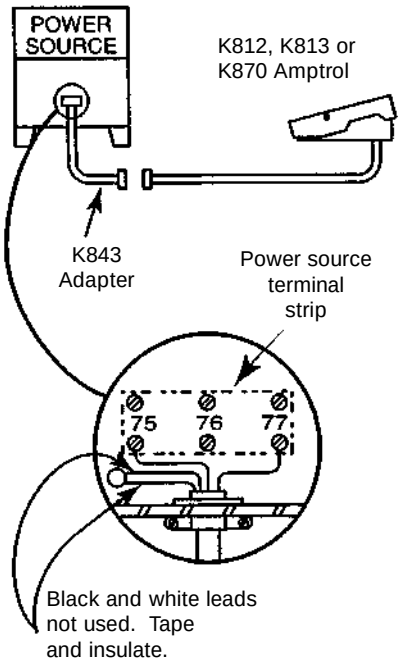

STRAIGHT PLUG (14 PIN)
TO POWER SOURCE
CABLE RECEPTACLE (6 SOCKET)
TO: 1) K857 REMOTE CONTROL
2) K812 HAND AMPTROL
3) K870 FOOT AMPTROL
CABLE RECEPTACLE (14 SOCKET)
TO: L-7 WIRE FEEDER

Return to Section TOC
Return to Master TOC

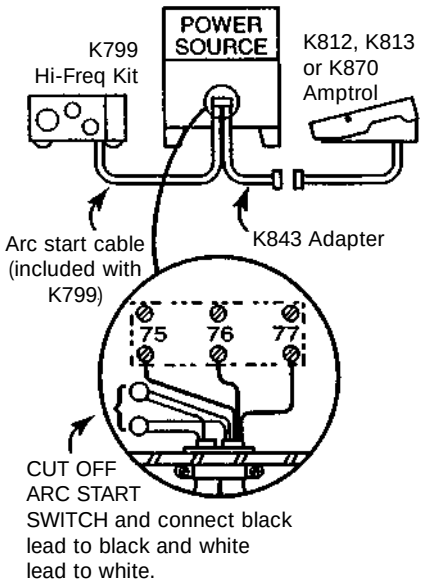
ACCESSORIES

K843 AMPTROL ADAPTER INSTALLATION INSTRUCTIONS (Continued)

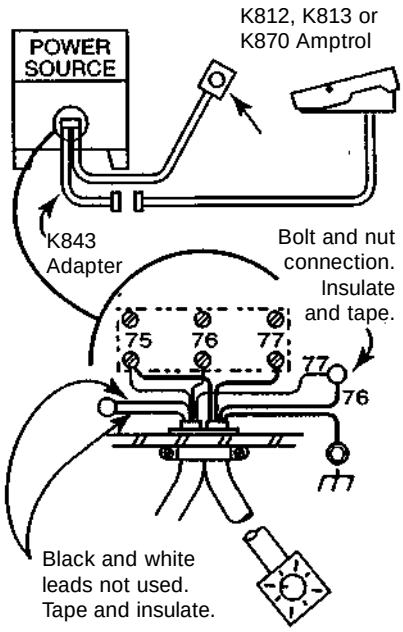
Amptrol Only: The Amptrol provides remote current control through the full range of the power source.



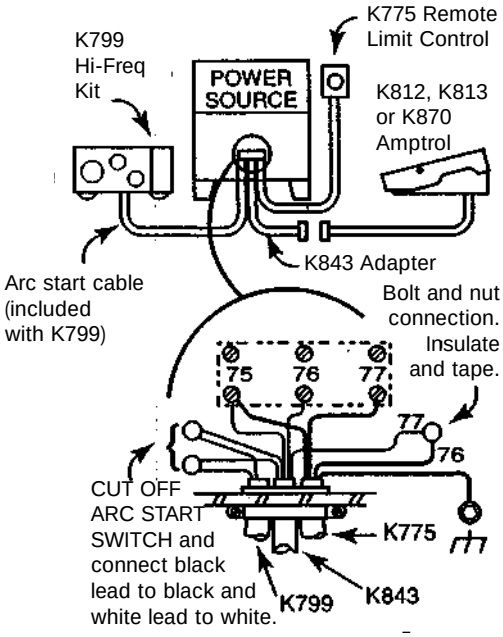
Amptrol and Hi-Freq. Kit: The Amptrol will start the Hi-Freq kit to turn on gas and high frequency starting for DC TIG welding. The Amptrol controls current through the full range of the power source.


K799 Hi-Freq Kit
POWER SOURCE
K812, K813 or K870 Amptrol
Arc start cable (included with K799)
K843 Adapter
75
76
77
CUT OFF ARC START SWITCH and connect black lead to black and white lead to white.

Amptrol Plus Remote Limit Control: The Amptrol provides remote current control from the minimum of the power source to a maximum set by the remote limit control.



Amptrol and Hi-Freq. Kit Plus Remote Limit Control: The Amptrol switch will start the Hi-Freq kit to turn on gas and high frequency starting for DC TIG welding. The Amptrol controls current from the minimum of the power source to a maximum set by the remote limit control.



LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

CAPACITOR DISCHARGE CIRCUIT (K828-1)

Mounts inside the DC-400. Recommended when:

- DC-400 is used in conjunction with any LN-23P or older LN-8 or LN-9 semiautomatic wire-feeder. Eliminates possible arc flash re-start of weld when trigger interlock is used. Not required with current LN-8 (above Code 8700), or LN-9s with serial numbers above 115187 (manufactured after 12/83), or any LN-9 having an L6043-1 Power PC Board.
- DC-400 is used with an LN-22 equipped with an older K279 Contactor-Voltage Control Option. Eliminates electrode overrun when gun trigger is released. Not required when later K279 (above Code 8800) is used.
- DC-400 is used with any semiautomatic wire-feeder and possible small spark is objectionable if electrode touches work just after gun trigger is released.

Install per M17060 instructions included with the kit.

HI-FREQ™ KIT (K799 FOR CODES 8634 AND ABOVE ONLY)

Kit supplies the high frequency plus gas valve for DC TIG welding. The DC-400 is shipped with proper R.F. bypass circuitry installed to protect the control circuit when welding with a HI-FREQ unit. K844 Water Valve Option Kit can be used with K799 when TIG welding with water cooled torches.

AMPTROL ADAPTER FOR K799 HI-FREQ KIT (K915. REQUIRES K864 ADAPTER OR K843 ADAPTER)

A “V” cable to connect a K799 Hi-Freq kit (5-pin connector) with either a K812 Hand Amptrol or a K870 Foot Amptrol (6-pin connector) and the machine. The cable going to the machine has a 6-pin connector which requires either a K864 adapter to connect with the 14-pin connector on the machine or a K843 adapter to connect to terminals #75, #76, #77 and the case grounding screw on the machine.

UNDERCARRIAGES (K817, K817R, K841)

For easy moving of the machine, optional undercarriages are available with either steel (K817) or rubber tired (K817R) wheels or a platform undercarriage (K841) with mountings for two gas cylinders at the rear of the welder.

Installation instructions are included with each kit.

CONNECTION OF LINCOLN ELECTRIC AUTOMATIC OR SEMIAUTOMATIC WIRE FEEDERS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

Auxiliary power for wire feeder operation is available at both a 14-pin amphenol and at terminal strips with screw-type connections located behind the hinged control panel on the front of the machine. The 14-pin amphenol can provide both 115 VAC (pins A and J) and 40-42 VAC (pins I and K). The terminal strip provides 115 VAC only (terminals 31 and 32). The two circuits are isolated, and each is protected by a 10A circuit breaker.

The following descriptions show how to connect the wire feeders using either the 14-pin amphenol or the terminal strip.

NOTE: The LN-742 wire feeder, because it operates on 42 VAC, can be connected only to the 14-pin amphenol.

AUTOMATIC WIRE FEEDERS

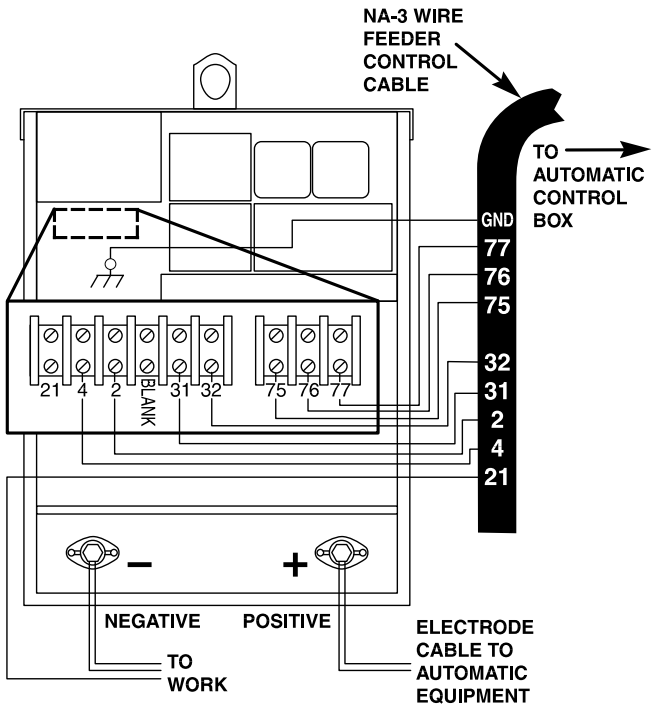
CONNECTING THE NA-3 TO THE IDEALARC DC-400 (TERMINAL STRIP)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set Idealarc DC-400 POWER toggle switch to the OFF (0) position.
3. Connect the wire feeder control cable leads to the Idealarc DC-400 terminal strip as shown in Figure C.4.

   Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

NOTE: The Idealarc DC-400 must be properly grounded.

FIGURE C.4 – NA-3 WIRE FEEDER CONNECTION TO THE IDEALARC DC-400



5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.
   b. An S-16586- X remote voltage sensing work lead is available for this purpose.
   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.

NOTE: The connection diagram shown in Figure C.4 shows the electrode connected for positive polarity. To change polarity:

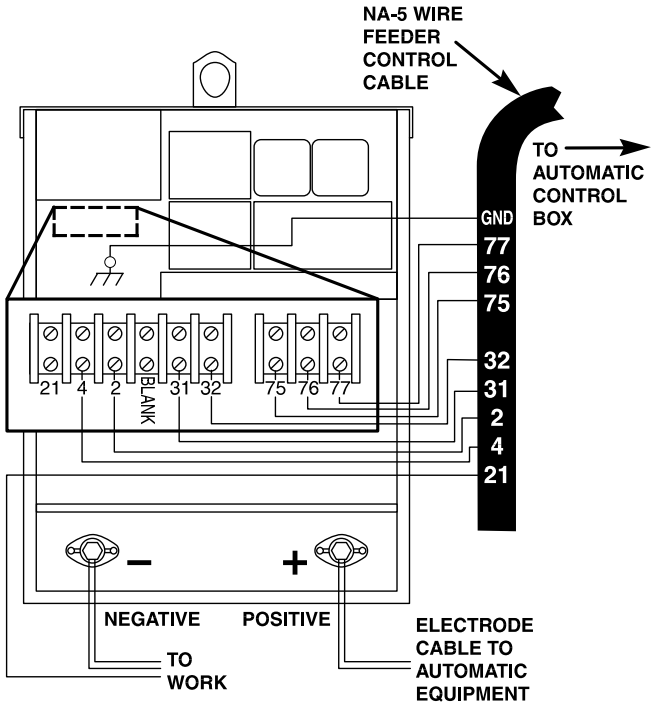
   a. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
   b. Move the electrode cable to the negative (-) output terminal.
   c. Move the work cable to the positive (+) output terminal.
   d. Set the VOLTMETER toggle switch to negative (-).

6. Set the DC-400 OUTPUT CONTROL switch to the “Remote” position and the OUTPUT TERMINALS switch in the “Remote” position.

CONNECTING THE NA-5 TO THE IDEALARC DC-400 (TERMINAL STRIP)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
3. Connect the wire feeder control cable leads to the Idealarc DC-400 terminal strip as shown in Figure C.5.

FIGURE C.5 – NA-5 WIRE FEEDER CONNECTION TO THE IDEALARC DC-400



NOTE: If using a K215 control cable, connect control cable leads #75, #76, and #77 to the matching #75, #76, and #77 terminals on the terminal strip of the Idealarc DC-400.

4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚.

NOTE: The Idealarc DC-400 must be properly grounded.

Return to Section TOC
Return to Master TOC

5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.
   b. An S-16586- X remote voltage sensing work lead is available for this purpose.
   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.
6. Connect NA-5 wire feeder control jumpers on Voltage Control Board. See NA-5 Operator's Manual.

NOTE: The connection diagram shown in Figure C.5 shows the electrode connected for positive polarity. To change polarity:

a. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
b. Move the electrode cable to the negative (-) output terminal.
c. Move the work cable to the positive (+) output terminal.
d. Set the VOLTMETER toggle switch to negative (-).

NOTE: For proper NA-5 operation, the electrode cables must be secured under the clamp bar on the left side of the NA-5 Control Box.

7. Set the DC-400 OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

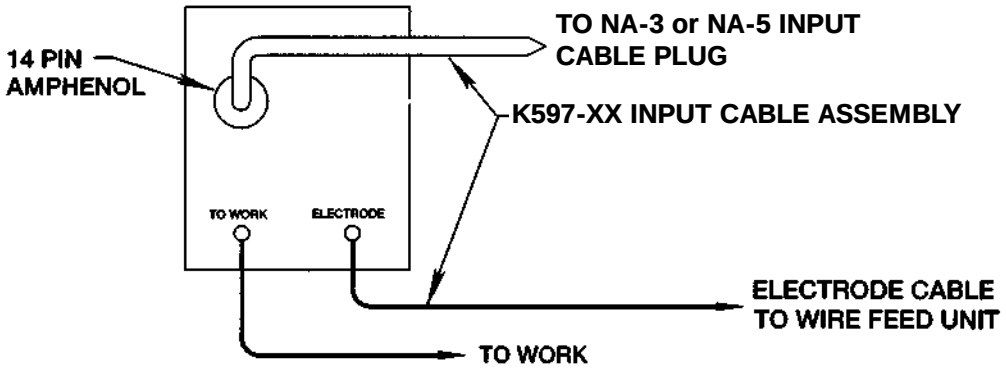
CONNECTING THE NA-3 OR NA-5 TO THE IDEALARC DC-400 (14-PIN AMPHENOL)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the Idealarc DC-400 POWER switch to the OFF (0) position.
3. Connect the electrode cable from the K597-XX Input Cable Assembly to the "+" terminal of the welder and to the wire feeder. Connect the work cable to the "-" terminal of the welder. Reverse this hookup for negative polarity. See Figure C.6.

   NOTE: Welding cable must be sized for the current and duty cycle of the application.

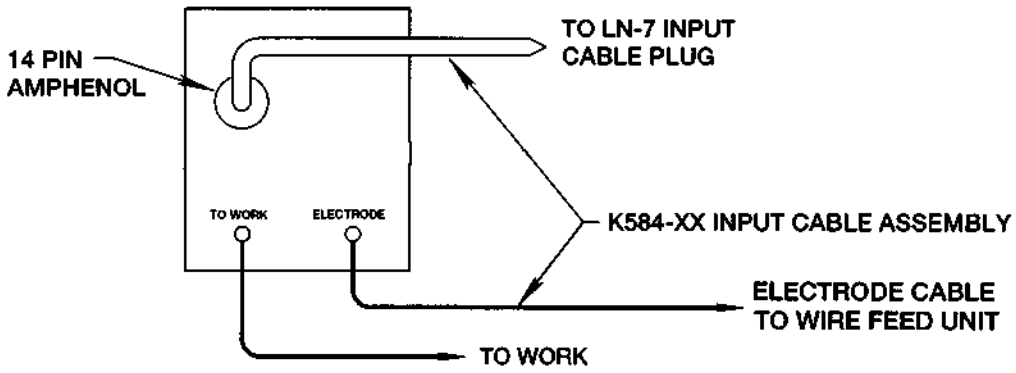
4. Set the welder VOLTMETER switch to the desired polarity, either DC (-) or DC (+).
5. Set the MODE switch to a CV (constant voltage) position.
6. Set the DC-400 OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

FIGURE C.6
IDEALARC DC-400/NA-3/NA-5 14-PIN AMPHENOL CONNECTION



Return to Section TOC
Return to Master TOC

FIGURE C.7
IDEALARC DC-400/LN-7 WITH K584 INPUT CABLE ASSEMBLY CONNECTION DIAGRAM



SEMIAUTOMATIC WIRE FEEDERS

CONNECTING THE LN-7 TO THE IDEALARC DC-400 (14-PIN AMPHENOL)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the POWER toggle switch to the OFF (0) position.
3. Connect the electrode cable from the K584-XX Input Cable Assembly to the “+” terminal of the welder and to the LN-7 wire feeder. Connect the work cable to the “-” terminal of the welder. Reverse this hookup for negative polarity.

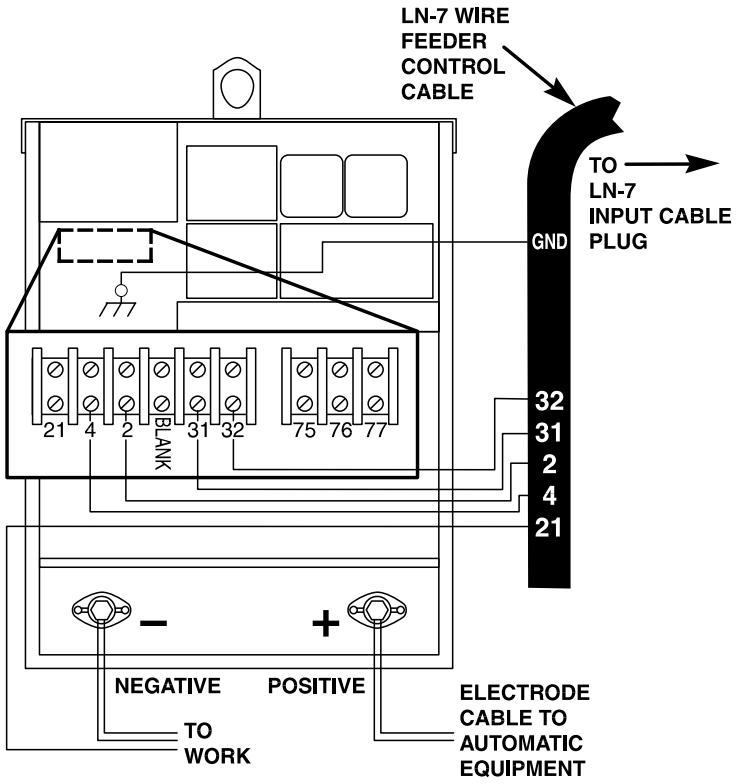
NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect K584-XX Input Cable between the DC-400 and the LN-7. See Figure C.7.
5. Set the welder VOLTMETER toggle switch to the desired polarity, either DC (-) or DC (+).
6. Set the MODE switch to a CV (constant voltage) position at the welder.
7. Adjust wire feed speed at the LN-7 and set the welding voltage with the OUTPUT CONTROL.

NOTE: If optional remote control is used, place the OUTPUT CONTROL and the OUTPUT TERMINALS switch in the “Remote” position.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE C.8 - LN-7 WIRE FEEDER CONNECTION TO THE IDEALARC DC-400



CONNECTING THE LN-7 TO THE IDEALARC DC-400 (TERMINAL STRIP)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
3. Connect the wire feeder control cable leads to the Idealarc DC-400 terminal strip as shown in Figure C.8.
4. Connect the wire feeder control cable ground lead to the frame terminal marked .

NOTE: The Idealarc DC-400 must be properly grounded.

5. PERFORM THIS STEP ONLY IF THE LN-7 IS EQUIPPED WITH A METER KIT.

   Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.

   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.

NOTE: If the work cable length is less than 25 feet and the connections to the work piece are secure, then wire feeder control cable lead #21 can be connected directly to the DC-400 terminal strip.

b. An S-16586- X remote voltage sensing work lead is available for this purpose.

c. Keep the #21 lead electrically separate from the work cable circuit and connection.

d. Tape the #21 lead to work cable for ease of use.

NOTE: The connection diagram shown in Figure C.8 shows the electrode connected for positive polarity. To change polarity:

a. Set the IDEALARC DC-400 POWER toggle switch to the OFF (0) position.

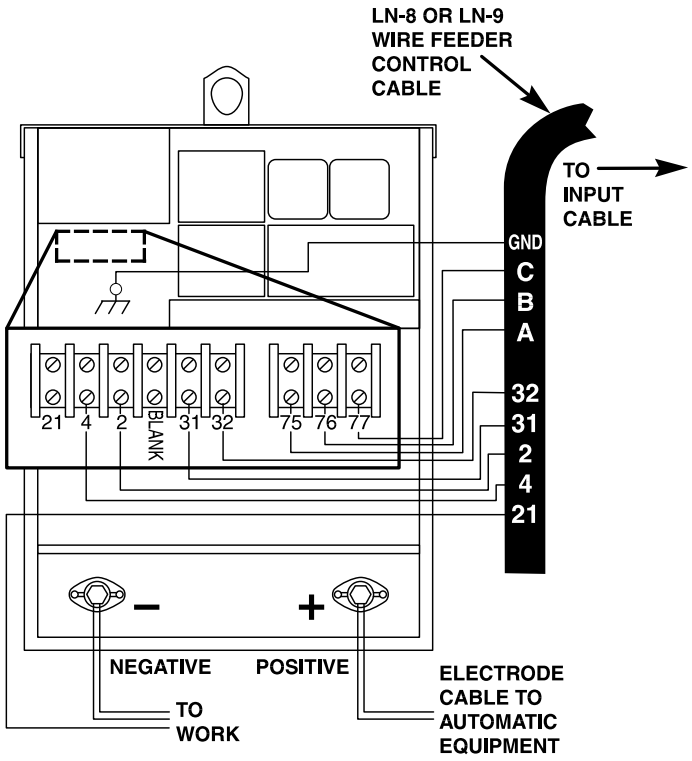
b. Move the electrode cable to the negative (-) output terminal.

c. Move the work cable to the positive (+) output terminal.

d. Set the VOLTMETER toggle switch to negative (-).

Return to Section TOC
Return to Master TOC

FIGURE C.9 - LN-8 OR LN-9 WIRE FEEDER CONNECTION TO THE IDEALARC DC-400



CONNECTING THE LN-8 OR LN-9 TO THE IDEALARC DC-400 (TERMINAL STRIP)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
3. Connect the wire feeder control cable leads to the Idealarc DC-400 terminal strip as shown in Figure C.9.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚.
5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.
   b. An S-16586- X remote voltage sensing work lead is available for this purpose.
   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.

NOTE: Using the extended #21 lead eliminates the need to use the LN-9's remote work lead accessory, which has a direct work lead jack.

6. Connect LN-9 wire feeder control jumpers on Voltage Control board. See LN-9 Operator's Manual.

NOTE: The connection diagram shown in Figure C.9 shows the electrode connected for positive polarity. To change polarity:

   a. Set the Idealarc DC-400 POWER toggle switch to the OFF (0) position.
   b. Move the electrode cable to the negative (-) output terminal.
   c. Move the work cable to the positive (+) output terminal.
   d. Set the VOLTMETER toggle switch to negative (-).

7. Set the OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

Return to Section TOC
Return to Master TOC

CONNECTING THE LN-8 OR LN-9 TO THE IDEALARC DC-400 (14-PIN AMPHENOL)

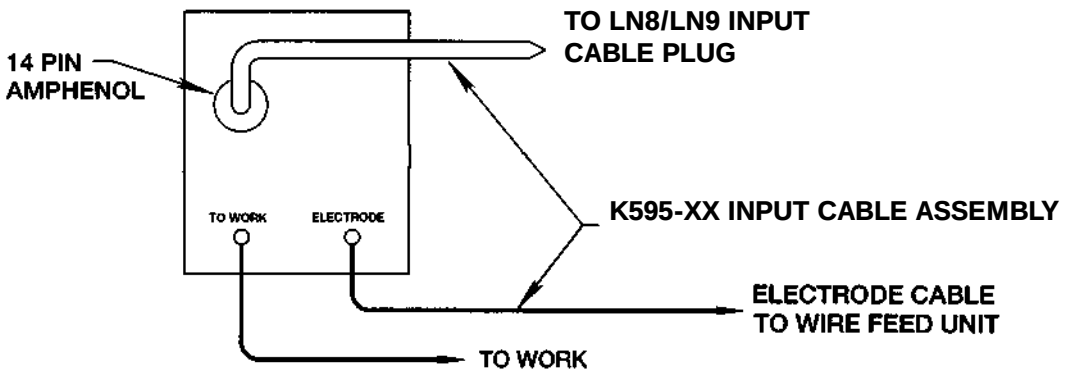
1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the POWER toggle switch to the OFF (0) position.
3. Connect the electrode cable from the LN-8 or LN-9 to the "+" terminal of the welder. Connect the work cable to the "-" terminal of the welder. Reverse this hookup for negative polarity. See Figure C.10.

NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect the input cable (K595-XX) between the 14-pin amphenol on the DC-400 and the input cable plug on the LN-8 or LN-9. See Figure C.10.
5. Set the welder VOLTMETER switch to the desired polarity, either DC (-) or DC (+).
6. Set the MODE switch to a CV (constant voltage) position.
7. Adjust wire feed speed at the LN-8 or LN-9 and set the welding voltage with the WIRE FEEDER VOLTAGE CONTROL.

Place the OUTPUT CONTROL switch in the "Remote" position and the OUTPUT TERMINALS switch in the "Remote" position.

FIGURE C.10 – IDEALARC DC-400/LN-8 OR LN-9 WITH K595-XX CABLE



Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

CONNECTING THE LN-742 TO THE IDEALARC DC-400 (14-PIN AMPHENOL)

1. Disconnect main AC input power to the Idealarc DC-400.
2. Set the POWER toggle switch to the OFF (0) position.
3. Connect the electrode cable from the LN-742 to the "+" terminal of the welder. Connect the work cable to the "-" terminal of the welder. Reverse this hookup for negative polarity. See Figure C.11.

NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect the K592 Control Cable to the 14-pin amphenol on the IDEALARC DC-400 and to the input cable plug on the LN-742. See Figure C.11.
5. Set the welder VOLTMETER switch to the desired polarity, either DC (-) or DC (+).
6. Set the MODE switch to a CV (constant voltage) position.
7. Adjust wire feed speed at the LN-742 and set the welding voltage with the output ARC CONTROL to a CV (constant voltage) position at the welder.

NOTE: If optional remote control is used, set the OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

FIGURE C.11 – IDEALARC DC-400/LN-742 CONNECTION DIAGRAM

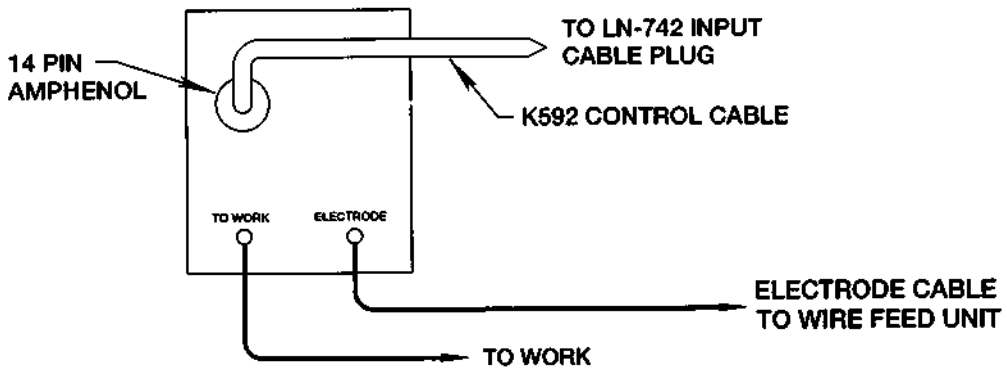


TABLE OF CONTENTS
-MAINTENANCE-

Maintenance .....**Section D**

Safety Precautions.....D-2

Routine and Periodic Maintenance D-2

General Component Locations.....D-3

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

MAINTENANCE

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

ROUTINE AND PERIODIC MAINTENANCE

Perform the following preventative maintenance at least once every six months.

Perform the following daily:

1. Check that no combustible materials are around the machine or in the welding or cutting area.
2. Remove any debris, dust, dirt, or materials that could block cooling air flow to the machine.
3. Inspect the electrode cables for any slits or punctures in the cable jacket. Also check for any other condition that could affect the proper operation of the machine.

Perform periodically:

1. In extremely dusty conditions, dirt may clog the cooling air channels, causing the machine to run hot. Blow out the machine at regular intervals with low pressure air. Clean the following parts. See Figure D.1.

- Main transformer and choke
- SCR/diode bridge
- Control PC board
- Starting PC board
- Electrode and work cable connections
- Fan assembly

NOTE: The fan motor has sealed bearings that require no service.

- Remote control terminal strip TS1.

NOTE: Keeping remote control terminal strip TS1 clean is especially important in damp locations.

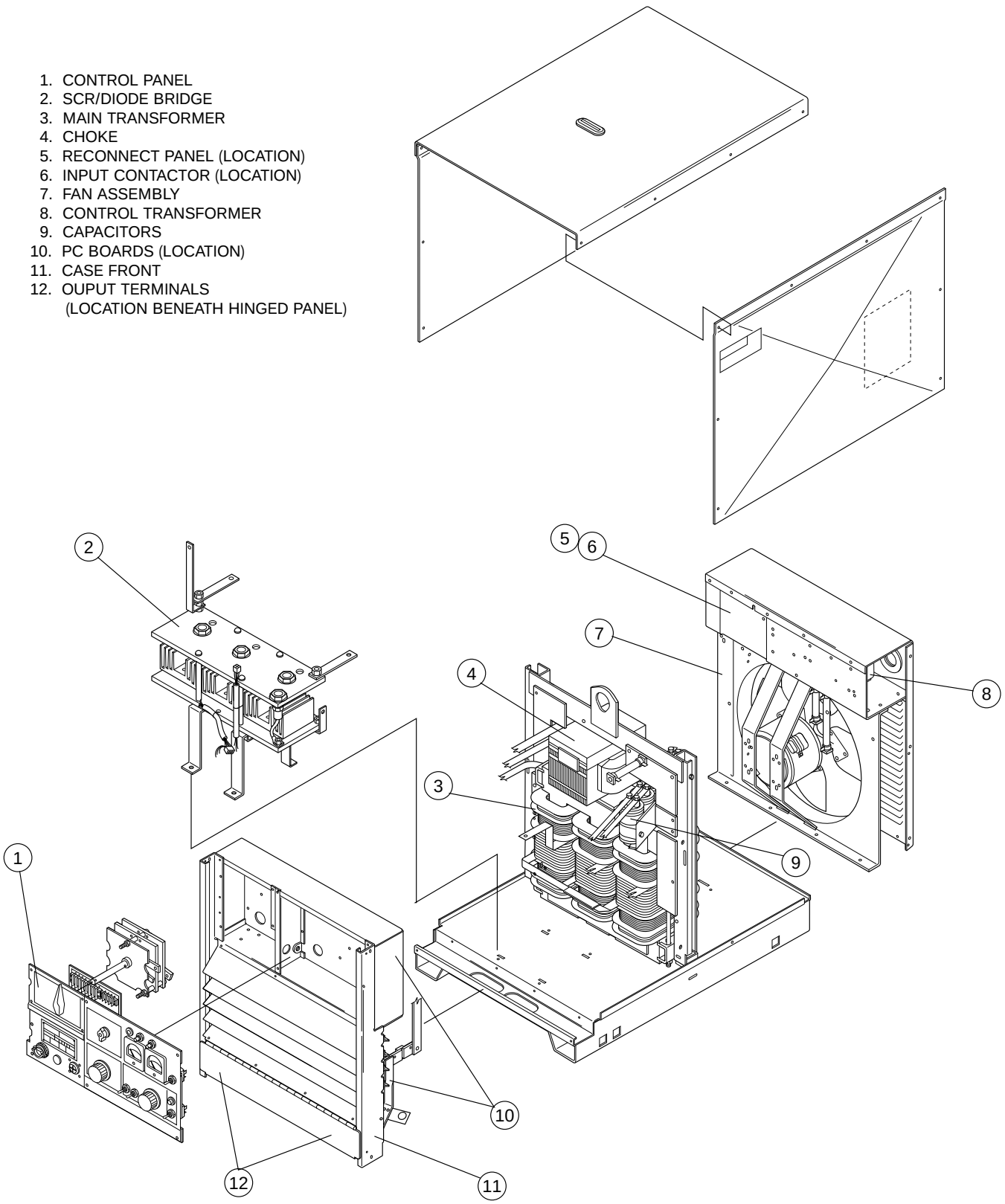
LINCOLN ELECTRIC

Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC

MAINTENANCE

FIGURE D.1 – GENERAL COMPONENT LOCATIONS

1. CONTROL PANEL
2. SCR/DIODE BRIDGE
3. MAIN TRANSFORMER
4. CHOKE
5. RECONNECT PANEL (LOCATION)
6. INPUT CONTACTOR (LOCATION)
7. FAN ASSEMBLY
8. CONTROL TRANSFORMER
9. CAPACITORS
10. PC BOARDS (LOCATION)
11. CASE FRONT
12. OUPUT TERMINALS
    (LOCATION BENEATH HINGED PANEL)



Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS
-THEORY OF OPERATION SECTION-

Theory of Operation .....**Section E**
General Description E-2
Input Line Voltage, Contactor and Main Transformer E-2
Output Mode and Control, Rectification and Feedback E-3
Protective Devices and Circuits E-4
SCR Operation.....E-5

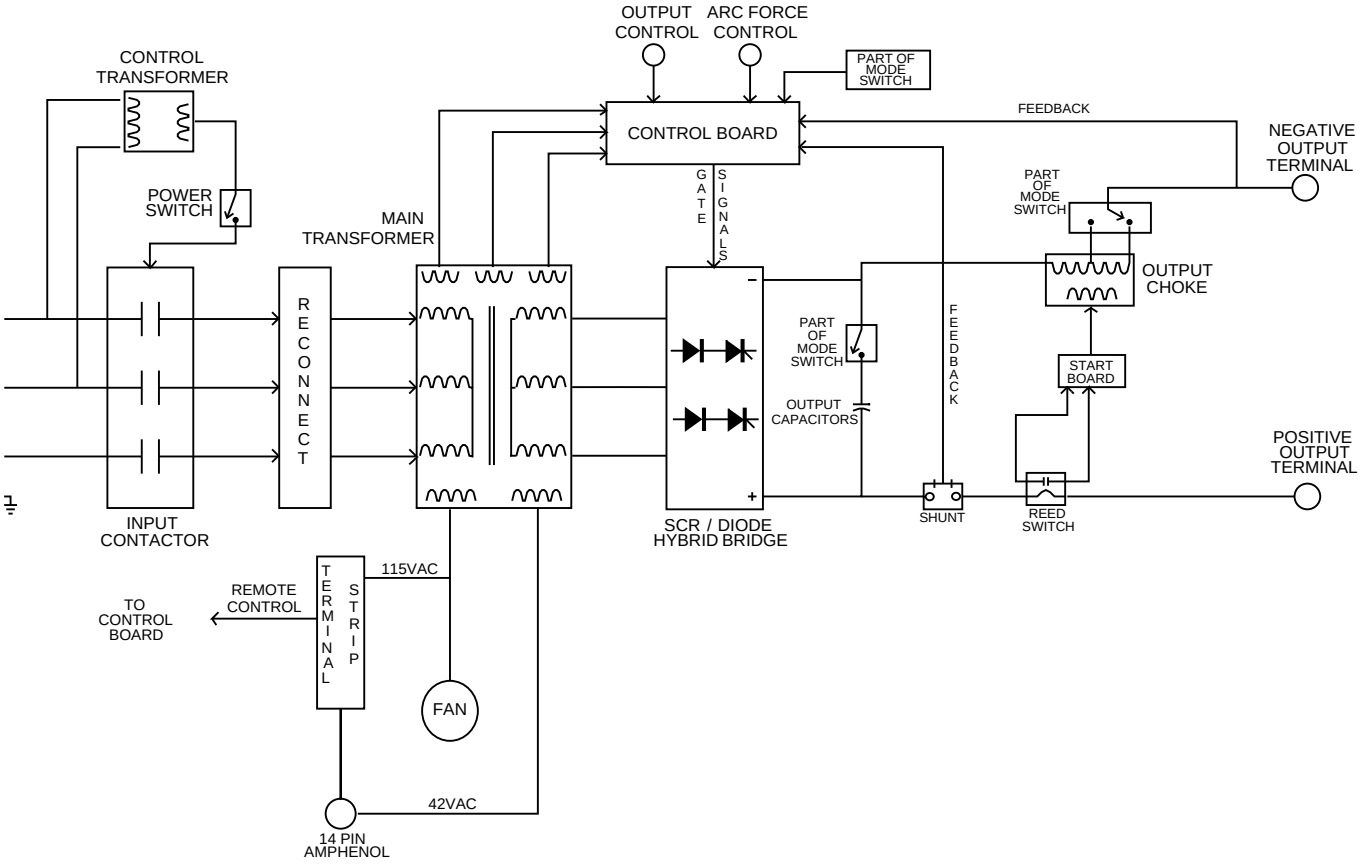
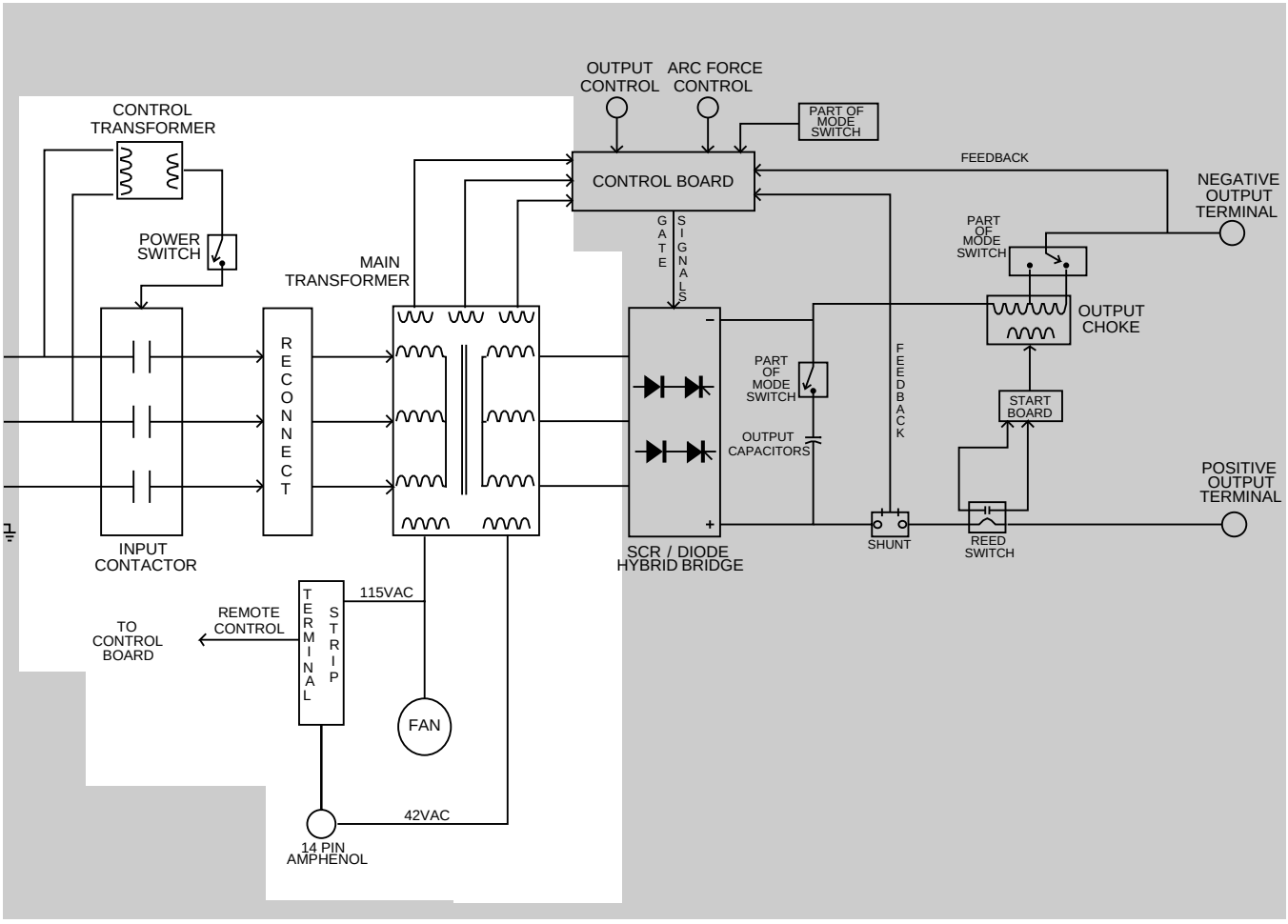


FIGURE E.1 – IDEALARC DC-400 BLOCK LOGIC DIAGRAM

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

THEORY OF OPERATION

FIGURE E.2 – INPUT LINE VOLTAGE, CONTACTOR AND MAIN TRANSFORMER



GENERAL DESCRIPTION

The DC-400 is a multiprocess welder power source capable of both constant voltage and constant current operation. Its power system is SCR controlled with solid state electronic circuitry. Minimum to maximum output is obtained with a single potentiometer control.

INPUT LINE VOLTAGE, CONTACTOR AND MAIN TRANSFORMER

The desired three-phase input power is connected to the DC-400 through an input contactor, located in the input box at the rear of the machine. Two phases of the input line are also connected to the control transformer, which, through the power switch, supplies power to activate the input contactor.

A reconnect panel allows the user to configure the machine for the desired input voltage. This AC input voltage is applied to the primary of the main transformer.

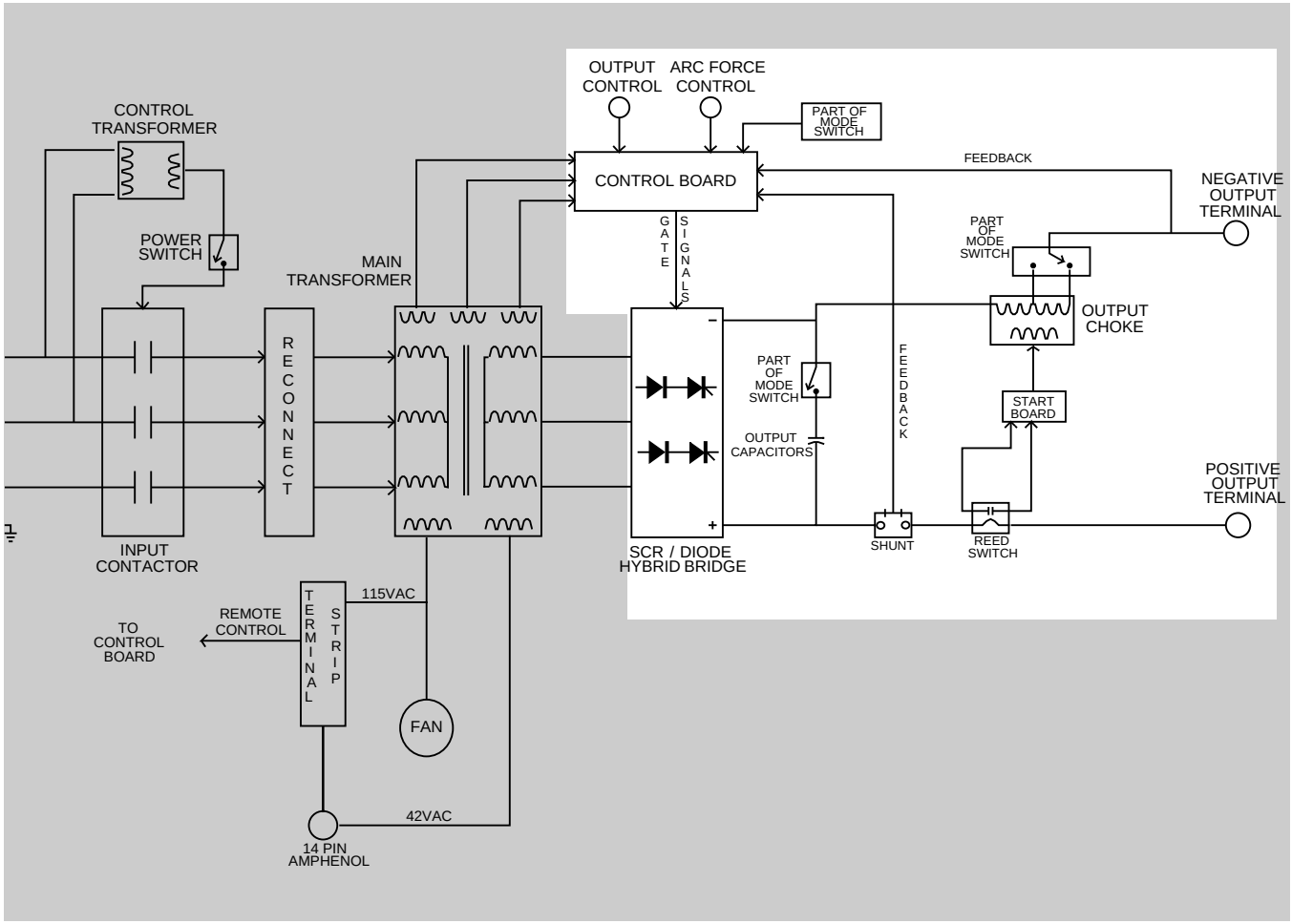
The transformer changes the high voltage, low current input power to a lower voltage, higher current output. The finishes or “neutrals” of the main secondary coils are connected together, and the three starts of the secondary windings are connected to the rectifier bridge assembly. In addition, the main transformer has separate and isolated 115VAC and 42VAC auxiliary windings. The 115VAC winding supplies power to the cooling fan and also offers 10 amps of auxiliary power, at the terminal strip and 14 pin amphenol, to operate wire feeding equipment. The 42VAC auxiliary power is available at the 14 pin amphenol only and is protected by a 10 amp circuit breaker. The three 21VAC phase angle windings are also housed in the main transformer assembly. These windings provide power and “timing” for the control board.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

THEORY OF OPERATION

FIGURE E.3 – OUTPUT MODE AND CONTROL, RECTIFICATION AND FEEDBACK



OUTPUT MODE AND CONTROL, RECTIFICATION AND FEEDBACK

The three-phase AC output from the main transformer secondary is rectified and controlled through the SCR/ diode bridge. Output current and voltage is sensed at the shunt and output terminals. This feedback information is processed in the control board. The control board compares the commands of the Mode Switch, the Arc Force Control (constant current mode only), and the Output Control (or remote control) with the feedback information and sends the appropriate gate firing signals to the SCR/diode bridge.

A “dry closure” of leads #2 and #4, either at the terminal strip or the 14 pin amphenol, signals the control board to apply gate firing signals to the SCR/ Diode Bridge, which creates a DC voltage at the output of the bridge assembly. If the Mode Switch is in the constant voltage (FCAW/GMAW) mode, this DC voltage is filtered by the Output Capacitors.

The heavy current carrying portion of the Mode Switch is connected between the output choke, which stores energy and provides current filtering, and the negative output terminal. Depending upon the mode selected, different portions of the choke are needed. In the constant current mode (CC), the entire choke is connected into the welding output circuit. When constant voltage (CV) is required, only part of the choke is utilized.

The starting circuit board function is to momentarily change the inductance effect that the choke has on the welding circuit. This is accomplished by changing the amount of “pinch” or arc control windings that are active in the output choke. When weld current is established, the reed switch closes and the start board becomes inactive.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

PROTECTIVE DEVICES AND CIRCUITS

Two thermostats protect the DC-400 from excessive operating temperatures and overload conditions. Excessive operating temperatures may be caused by insufficient cooling air or by operating the machine beyond the duty cycle and output rating. The primary thermostat, located on the nose of the bottom center primary coil, will activate if the machine is overloaded. The machine will not have output, the amber thermal protection light will glow, and the fan will continue to run.

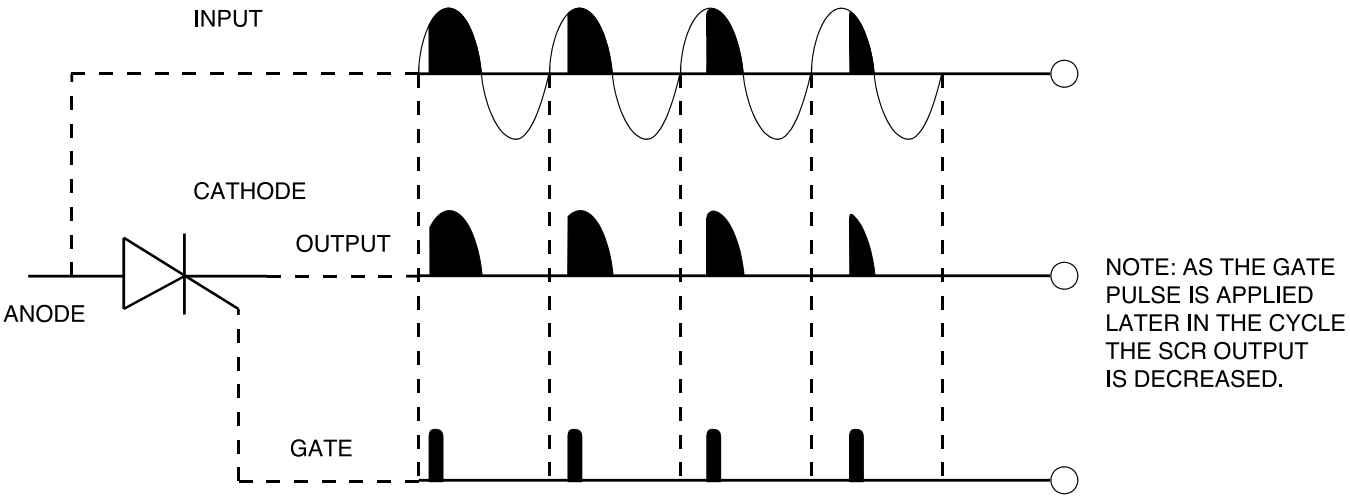
The secondary thermostat, located on the lead connecting the secondary coils together, will open either with an excessive overload or insufficient cooling. The machine will not have output, the amber protection light will be on, and the fan should continue to operate. When the thermostats reset, the amber protection light will be off.

Upon restart, if the fan does not turn or the air intake louvers are obstructed, the input power must be removed and the fan problem or air obstruction corrected.

The DC-400 is also protected against overloads on the SCR/diode bridge assembly through an electronic protection circuit located on the control board. This circuit senses an overload on the power source and limits the output to 550 amps by phasing back the SCRs.

A circuit is also provided to protect the circuitry from accidental grounds. If the external remote control leads (#75, #76 or #77) are accidentally connected to the positive output welding lead, the DC-400 output will be reduced to a low level, thus preventing damage to the machine. If an erroneous connection is made between the remote control leads and the negative output welding lead, the control board self-restoring fuses will blow, preventing damage to the machine.

FIGURE E.4 – SCR Operation



SCR OPERATION

A silicon controlled rectifier (SCR) is a three terminal device used to control rather large currents to a load. An SCR acts very much like a switch. When a gate signal is applied to the SCR, it is turned ON and there is current flow from anode to cathode. In the ON state, the SCR acts like a closed switch. When the SCR is turned OFF, there is no current flow from anode to cathode; thus the device acts like an open switch. As the name suggests, the SCR is a rectifier; so it passes current only during positive half cycles of the AC supply. The positive half cycle is the portion of the sine wave in which the anode of the SCR is more positive than the cathode.

When an AC supply voltage is applied to the SCR, the device spends a certain portion of the AC cycle time in the ON state and the remainder of the time in the OFF state. The amount of time spent in the ON state is controlled by the gate.

An SCR is fired by a short burst of current into the gate. This gate pulse must be more positive than the cathode voltage. Since there is a standard PN junction between gate and cathode, the voltage between these terminals must be slightly greater than 0.6V. Once the SCR has fired, it is not necessary to continue the flow of gate current. As long as current continues to flow from anode to cathode, the SCR will remain on. When the anode to cathode current drops below a minimum value, called holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave. If the SCR is turned on early in the positive half cycle, the conduction time is longer, resulting in greater SCR output. If the gate firing occurs later in the cycle, the conduction time is less, resulting in lower SCR output.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS
TROUBLESHOOTING & REPAIR SECTION

Troubleshooting & Repair Section ..... **Section F**

How to Use Troubleshooting Guide F-2

PC Board Troubleshooting Procedures F-3

Troubleshooting Guide ..... F-4 - F-14

Test Procedures
- Input Contactor Test F-15
- Control Transformer (T2) Voltage Test F-18
- Main Transformer (T1) Voltage Test F-21
- Static SCR/Diode Rectifier Bridge Test F-26
- Active SCR Test F-29

Oscilloscope Waveforms F-33
- Normal Open Circuit Voltage Waveform-Constant Current Mode F-33
- Normal Open Circuit Voltage Waveform-Constant Voltage FCAW/GMAW F-34
- Normal Open Circuit Voltage Waveform-Constant Voltage Subarc F-35
- Typical Output Voltage Waveform-Constant Voltage FCAW/GMAW F-36
- Typical Output Voltage Waveform-Constant Voltage Subarc F-37
- Typical SCR Gate Voltage Waveform-Constant Voltage Subarc F-38
- Abnormal Open Circuit Voltage Waveform-Constant Voltage Subarc F-39

Replacement Procedures F-40
- Input Contactor (CR1) Cleaning/Replacement F-40
- Fan Motor and Blade Removal and Replacement F-42
- SCR/Diode Rectifier Assembly Removal and Replacement F-44
- SCR Removal and Replacement F-46
- Mounting of Stud Type Diodes to Aluminum Heat Sinks F-52
- Main Transformer Removal and Replacement F-54

Retest After Repair F-61

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM). Look under the column labeled "PROBLEM (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into two main categories: Output Problems and Welding Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. PERFORM COMPONENT TESTS. The last column, labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

Have an electrician install and service this equipment. Turn the machine OFF before working on equipment. Do not touch electrically hot parts.

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

ATTENTION
Static-Sensitive Devices
Handle only at Static-Safe Workstations

Reusable Container
Do Not Destroy

PC Board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC Board must be either conductive, anti-static or static-dissipative.
- Remove the PC Board from the static-shielding bag and place it directly into the equipment. Don't set the PC Board on or near paper, plastic or cloth which could have a static charge. If the PC Board can't be installed immediately, put it back in the static-shielding bag.
- If the PC Board uses protective shorting jumpers, don't remove them until installation is complete.
- If you return a PC Board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
Machine is dead – no output – no fan – no pilot light.	1. Make sure that the input Power switch is in the "ON" position. 2. Check the three-phase input voltage at the machine. Input voltage must match the rating plate and the reconnect panel. 3. Check for blown or missing fuses in the input lines.	1. Check the Power switch (S1) for proper operation. 2. Check the leads associated with the Power switch (S1) and the control transformer (T2) for loose or faulty connections. See Wiring Diagram. 3. Perform the ***Control Transformer Test.***

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine is dead – no output – no fan – the pilot light is lit.	1. Check the three-phase input voltage at the machine. Input voltage must match the rating plate and the reconnect panel. 2. Check for blown or missing fuses in the input lines.	1. Perform the ***Input Contactor Test.*** 2. Check the associated leads, for loose or faulty connections, between the input contactor (CR1), the reconnect panel and the main transformer. See Wiring Diagram. 3. Perform the ***Main Transformer Test.***

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The input contactor operates – the fan runs – the pilot light is lit – but the machine has no welding output.	1. If the amber thermal protection light is lit, the primary or secondary thermostat is open. Allow machine to cool. 2. Make certain the output trigger circuit (#2 and #4) is being activated either by an external "closure" or by the output terminals switch (S3). 3. Check the 10A circuit breaker in the 42VAC line. 4. If remote control is not being used, make certain the Output Control switch (S2) is in the OUTPUT CONTROL "LOCAL" position. 5. Check for loose or faulty weld cable connections.	1. Perform the ***Main Transformer Test.*** 2. Perform the ***SCR/Diode Rectifier Bridge Test.*** 3. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine has high welding output and no control.	1. If remote control is being used, set the Output Control switch (S2) in the OUTPUT CONTROL "LOCAL" position and control the weld output with the machine Output Control potentiometer (R4). If the problem is solved, check the remote control unit (or wire feeder) and associated control cable.	1. Check the Output Control switch (S2) and associated wiring. 2. Check feedback leads #225 (negative output terminal), #205 and #206 (output shunt) for loose or faulty connections. See Wiring Diagram. 3. Perform the ***SCR/Diode Rectifier Bridge Test.*** 4. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC Return to Section TOC Return to Master TOC

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine has minimum welding output and no control.	1. If remote control is being used, set the Output Control switch (S2) in the OUTPUT CONTROL "LOCAL" position and control the weld output with the machine Control potentiometer (R4). If the problem is solved, check the remote control unit (or wire feeder) and associated control cable. 2. Make certain the remote control leads (#75, #76 and #77) are not grounded to the positive welding output. 3. Make certain the three-phase input voltage is correct and matches the machine rating and the reconnect panel.	1. Check the Output Control potentiometer (R4) and associated wiring. See Wiring Diagram. 2. Check the welding Mode switch (S4), the microswitches, and the associated wiring. 3. Check the Output Control switch (S2) and associated wiring. See Wiring Diagram. 4. Perform the ***Main Transformer Test.*** 5. Perform the ***SCR/Diode Rectifier Bridge Test.*** 6. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine does not have maximum output.	1. Make certain the correct three-phase input voltage is being applied to the machine. 2. If remote control is being used, set the Output Control switch (S2) in the OUTPUT CONTROL "LOCAL" position and control the weld output with the machine Control potentiometer (R4). If the problem is solved, check the remote control unit (or wire feeder) and associated control cable.	1. Check the Output Control potentiometer (R4). Normal resistance is 10,000 ohms. Also check associated wiring for loose or faulty connections. See Wiring Diagram. 2. Check the welding Mode switch (S4), the microswitches, and the associated wiring. 3. Check the Output Control switch (S2) and associated wiring. See Wiring Diagram. 4. Perform the ***Main Transformer Test.*** 5. Perform the ***SCR/Diode Rectifier Bridge Test.*** 6. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The machine will not shut off when the power switch is put in the OFF position.	1. Make sure the three-phase input lines are connected correctly to the DC-400.	1. Check the Input Power switch (S1) and the associated leads. See Wiring Diagram. 2. Perform the ***Input Contactor Test.***
The Arc Control switch (S5) has no effect in CV (FCAW/GMAW) mode when welding with the short circuit transfer process.	1. Make sure the correct process and gas are being used.	1. Check the Arc Control switch (S5) for proper operation. 2. Check the welding Mode switch (S4), the microswitches, and the associated wiring. 3. Check to make sure the output choke control coil is not “open” or grounded. See Wiring Diagram. 4. Check resistor R1. Normal resistance is 15 ohms.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The output terminals are always electrically “hot.”	1. Make certain the Output Terminals switch (S3) is in the “REMOTE” position. 2. Remove any external leads hooked to the 14 pin amphenol and/or the terminal strip. If the problem disappears, the fault is in the control cable or wire feeder.	1. Check for an internal short between leads #2 and #4. See Wiring Diagram. 2. Check the Output Terminals switch (S3) for proper operation. Also check associated leads. See Wiring Diagram. 3. Remove plug P3 (SCR gate leads) from the control board. If the problem disappears, the control board may be faulty. Replace. If the output terminals are still electrically “hot,” perform the ***SCR/Diode Rectifier Bridge Test.*** 4. The snubber board may be leaky. Check or replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
Poor arc striking when using semi-automatic or automatic wire feeders.	1. Make sure the correct weld procedures are being used. (Electrode, Gas, Etc.) 2. Check the welding cables for loose or faulty connections.	1. Check reed switch CR3 for proper operation. Switch should be normally open until weld current is established. 2. The start board may be faulty. Replace. 3. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
Poor arc characteristics when welding in the constant voltage (CV) mode.	1. Make sure the correct weld procedures are being used. (Electrode, Gas, Etc.) 2. Check the welding cables for loose or faulty connections.	1. Check reed switch CR3 for proper operation. Switch should be normally open until weld current is established. 2. Remove plug P6 from the start board. If problem is resolved, the start board may be faulty. Replace. See Wiring Diagram. 3. Check the welding Mode switch (S4), the microswitches, and the associated wiring. 4. Check the output capacitors and connections. A capacitor failure is indicated if the small vent plug on top of a capacitor is raised or blown out. **WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body. Clean up vented electrolyte using rubber gloves and a water damped cloth. Any electrolyte which gets on skin, clean with soap and water.**

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The Arc Force control (R5) has no effect on the arc.	1. The Arc Force control is active only in the Stick Mode. 2. The effect of the Arc Force control will be less noticeable at high welding currents. Weld at low currents (less than 150 amps) and check the Arc Force control function.	1. Check the Arc Force control potentiometer (R5) for correct resistance and proper operation. Normal resistanace is 10,000 ohms. 2. Check the continuity of leads #204, #208, and #209 from the Arc Force control to the control board. 3. The control board may be faulty. Replace.
The welding arc is variable and sluggish.	1. Check the input voltage at the DC-400, making sure the correct voltage and all three phases are being applied to the machine. 2. Make sure welding process is correct for machine settings. 3. Check welding cables for loose or faulty connections. Also make sure cables are sized correctly for welding current.	1. Check the welding Mode switch (S4), the microswitches, and the associated wiring. 2. Perform the ***SCR/Diode Rectifier Bridge Test.*** 3. Perform the ***Main Transformer Test.*** 4. The control board may be faulty. Replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

This test will help determine if the input contactor is receiving the correct coil voltage and if the contacts are functioning correctly.

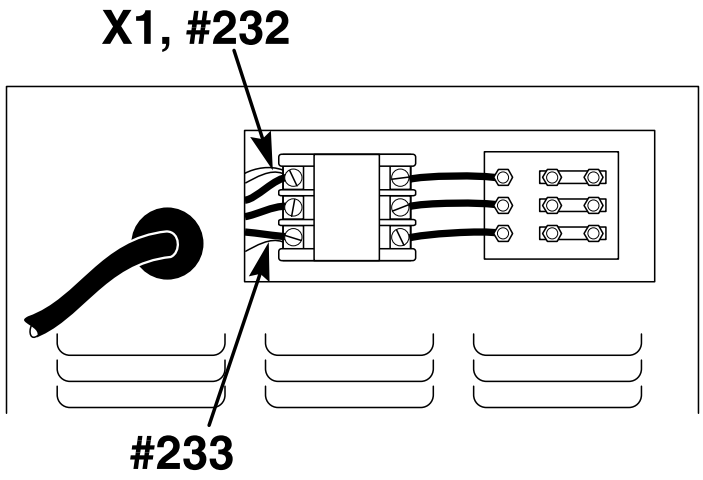
MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
5/16” Nut driver
Idealarc DC 400 Wiring Diagrams (See the Electrical Diagrams section of this manual.)
External 120VAC supply

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST *(continued)*

FIGURE F.1 – INPUT CONTACTOR CONNECTIONS



TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16” nut driver, remove the case top and the reconnect panel cover.
3. Locate the two leads connected to the input contactor coil, #233 and X1 #232 (top). See Figure F.1 for location.
4. Connect an AC voltmeter to the leads.

⚠ WARNING

Electric Shock can kill.

- With the input power on, there are high voltages inside the machine. Do not reach into the machine or touch any internal part of the machine while the power is on.

5. Apply the correct voltage to the machine and turn the power switch (S1) ON.
6. Check for 120VAC at the contactor coil leads.

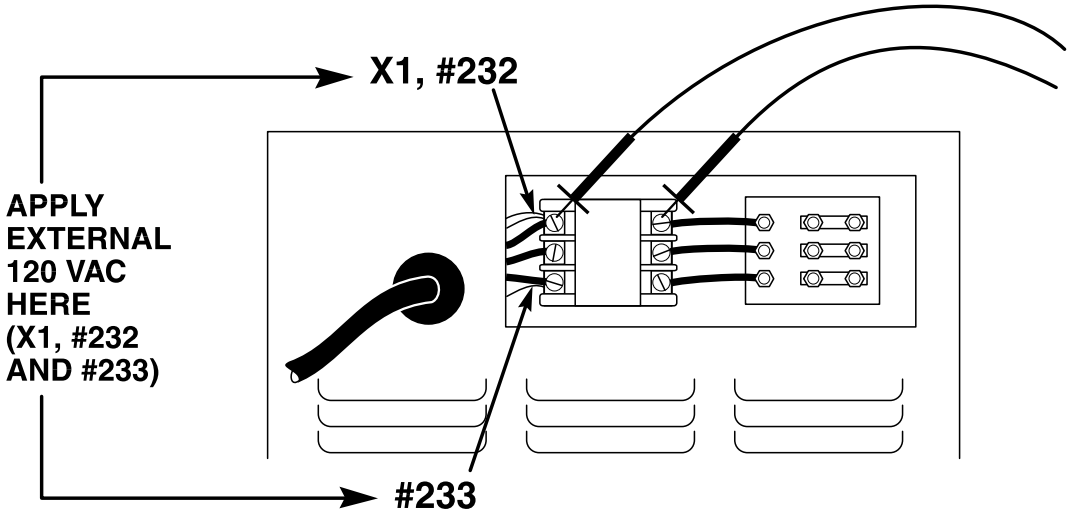
   If the 120VAC is NOT present, with the power switch (S1) on, check the power switch (S1) and associated circuitry. See the Wiring Diagram. Also perform the ***Control Transformer (T2) Voltage Test.***

   If the 120VAC is present and the contactor does NOT activate, then the input contactor is faulty. Replace the input contactor.

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST *(continued)*

FIGURE F.2 – INPUT CONTACTOR TEST CONNECTIONS



TEST FOR CONTACT CONTINUITY

1. Disconnect the main input supply power to the machine.
2. Remove the two leads connected to the input contactor coil, #233 and X1/#232. See ***Figure F.1*** for location.
3. Using the external 120VAC supply, apply 120VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace the input contactor.
4. With the contactor activated, check the continuity across the contacts. (Zero ohms or very low resistance is normal.) See Figure F.2. If the resistance is high, the input contactor is faulty. Replace the input contactor.
5. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty. Replace the input contactor.

Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) VOLTAGE TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of the control transformer and induced on the secondary winding of the control transformer.

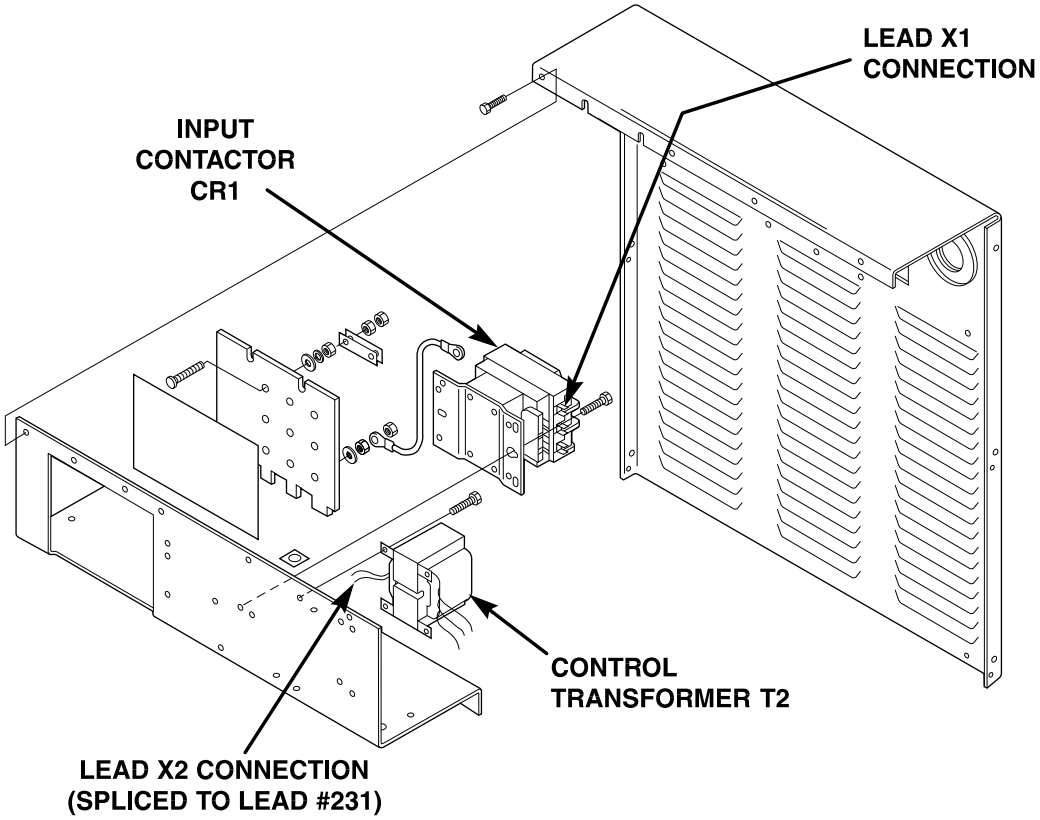
MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
5/16” Nut driver
IDEALARC DC-400 Wiring Diagrams (See the Electrical Diagrams section of this manual.)

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

FIGURE F.3 – CONTROL TRANSFORMER AND LEAD LOCATIONS



TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16” nut driver, remove the top, case sides, and lower the front control panel.
3. Locate the control transformer (T2) on the left side of the input box (facing the back of the machine). See Figure F.3.
4. Locate the control transformer primary leads (H1, H2, H3, etc.). See the Wiring Diagram.

   NOTE: Unused leads should be taped.

   a. Inspect for broken or incorrect connections.
5. Locate control transformer leads X1 (top) and X2.

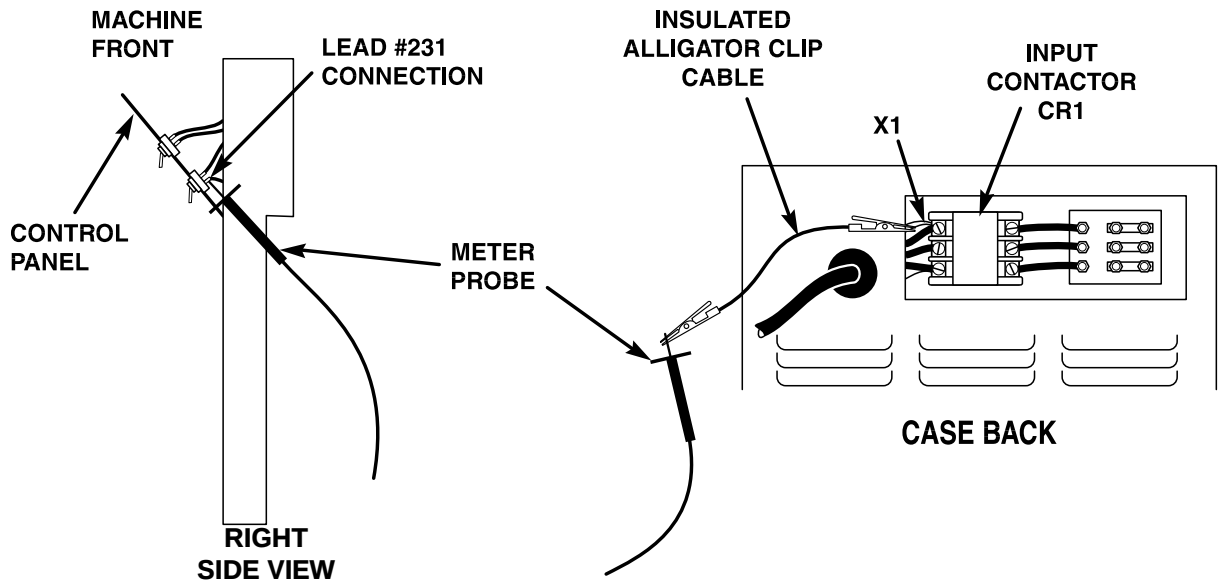
   a, Lead X1 is connected to the input contactor (CR1) coil located on the input side of the contactor. See Figure F.3.

   b. Lead X2 is spliced into lead #231. See the Wiring Diagram. Lead #231 is connected to the power switch (S1). Remove five machine screws holding the control panel to the case front and tilt the panel forward to access the power switch and Lead #231 connection. ***See Figure F.4.***

Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

FIGURE F.4 – CONTROL TRANSFORMER X1 AND X2 TEST CONNECTIONS



6. Test for 115VAC between leads X1 and #231.

   NOTE: If the main AC input supply voltage varies, the control transformer voltage will vary by the same percentage.

   a. Connect one end of an insulated alligator clip to the X1 connection at the input contactor (CR1) coil. See Figure F.4.

   b. Connect the other end of the alligator clip to one of the meter probes. Be sure that neither the alligator clip nor the meter probe touches any metal surfaces.

   c. Connect the other meter probe to the #231 connection (top lead) at the power switch. See Figure F4.

   d. Apply input power to the DC-400.

7. Read the meter for 115VAC.

   a. If 115VAC is present, the control transformer is functioning properly.

   b. If 115VAC is NOT present, go to Step 8.

8. If 115VAC is not present between leads X1 and #231, check the spliced connection between #231 and X2. Test for correct main input supply power to the control transformer primary windings (H1, H2, H3, etc.). Check the main input supply power hookup to the machine. See the Wiring Diagram.

   a. If the correct main input supply power to the control transformer primary windings is present AND the secondary voltage is not correct, the control transformer may be faulty. Replace.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

This test will determine if the correct voltages are being applied to the primary windings of the Main Transformer (T1) and induced on the secondary winding, auxiliary windings, and phase angle windings.

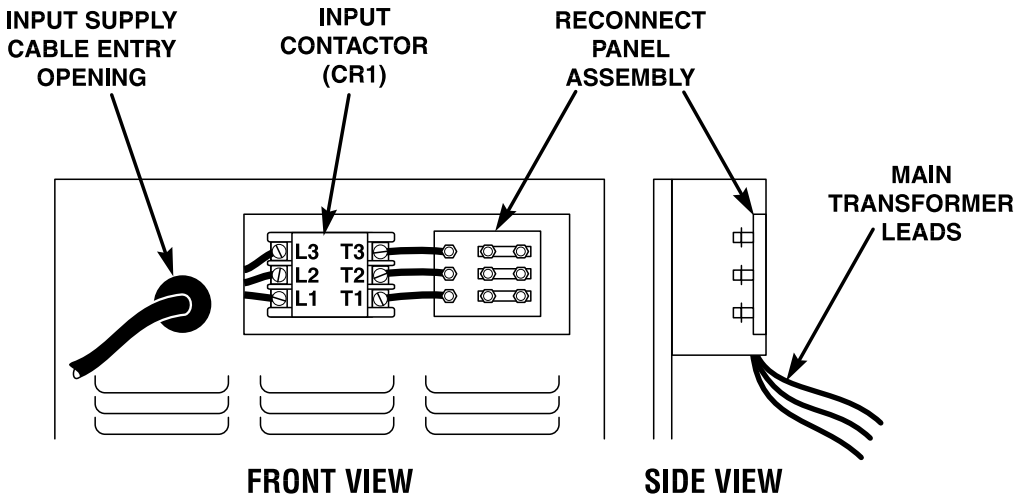
MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
5/16” Nut driver
IDEALARC DC-400 Wiring Diagram (See Electrical Diagrams section of Manual.)

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.5 – INPUT CONTACTOR, RECONNECT PANEL, AND PRIMARY LEADS TO MAIN TRANSFORMER LOCATIONS



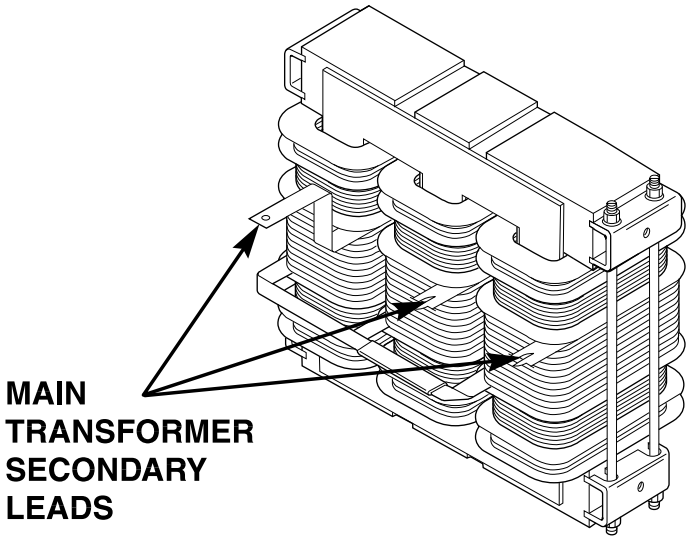
TEST PROCEDURE

1. Set the ON/OFF power switch to OFF.
2. Disconnect main input supply power from the machine.
3. With the 5/16” nut driver, remote the case top and sides and the reconnect panel cover.
4. Inspect the input contactor, reconnect panel, and primary leads to the main transformer for loose or faulty connections. See Figure F.5.
   a. Confirm that the reconnect panel is connected properly for the three-phase main input supply power supplied to the machine. See the reconnect panel connection diagram located on the inside of the input box assembly access door.
5. Connect main input supply power to the machine.
6. Set the ON/OFF power switch to ON.
   a. Make sure the input contactor (CR1) energizes and the fan runs.
7. Test with an AC voltmeter for proper main input supply voltage to the line side of the input contactor (CR1). See the Wiring Diagram.
   a. L1 to L2.
   b. L2 to L3.
   c. L1 to L3.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.6 – MAIN SECONDARY LEAD TEST POINTS

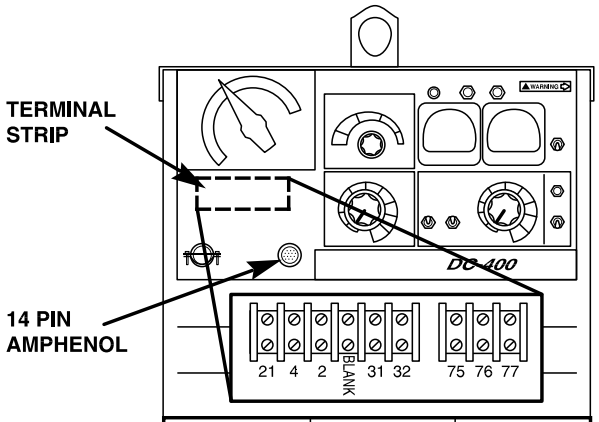


8. Read the meter.
   a. If proper voltage is present for all three phases, proper main input supply voltage is being supplied.
   b. If proper voltage is not present in any or all of the three phases, check input fuses and leads.
9. Test with an AC voltmeter for proper main input supply voltage from the output side of the input contactor (CR1). See the Wiring Diagram.
   a. T1 to T2.
   b. T2 to T3.
   c. T1 to T3.
10. Read the meter.
   a. If proper voltage is present for all three phases, the input contactor is working properly.
   b. If the proper voltage is not present for any or all of the three phases, the input contactor may be faulty. Replace the input contactor.
11. Test with an AC voltmeter for approximately 42VAC across each of the three main secondary start leads located at the SCR/Diode Rectifier Bridge. Remove the red insulating paint to achieve good contact if necessary. See Figure F.6. See the Wiring Diagram.
   a. If one or more of the above voltage tests are incorrect, check for loose or faulty connections.
   b. If the connections are good, then the main transformer may be faulty. Replace the main transformer.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.7 – PHASE ANGLE WINDINGS TEST POINTS AND TERMINAL STRIP LOCATION



From	To	Expected VAC
Terminal Strip Lead #31	Terminal Strip Lead #32	115
Amphenol Pin K (Lead #42)	Amphenol Pin I (Lead #41)	42

12. Test for 115VAC between leads #31 and #32 on the terminal strip. Also test for 42VAC between pin K (lead #42) and pin I (lead 41) in the 14 pin amphenol.

    a. Remove the sheet metal screws from the control box cover with the 5/16" nut driver and flip the cover down. It does not have to be completely removed to perform the tests.

    b. If the above voltage checks are incorrect, check for loose or faulty wiring. Check continuity.

    c. If the wiring is good, then the main transformer may be faulty. Replace the main transformer.

13. Test with an AC voltmeter for 21VAC for each phase angle winding at plug P1 on the control board as shown in ***Figure F.8*** and the accompanying table.

    NOTE: If the main input supply voltage varies, the main transformer voltages will vary proportionately.

    a. If the voltage is low, remove plug P1 and recheck the voltage for 21VAC. If the reading is normal, the control board may be faulty. Replace the control board.

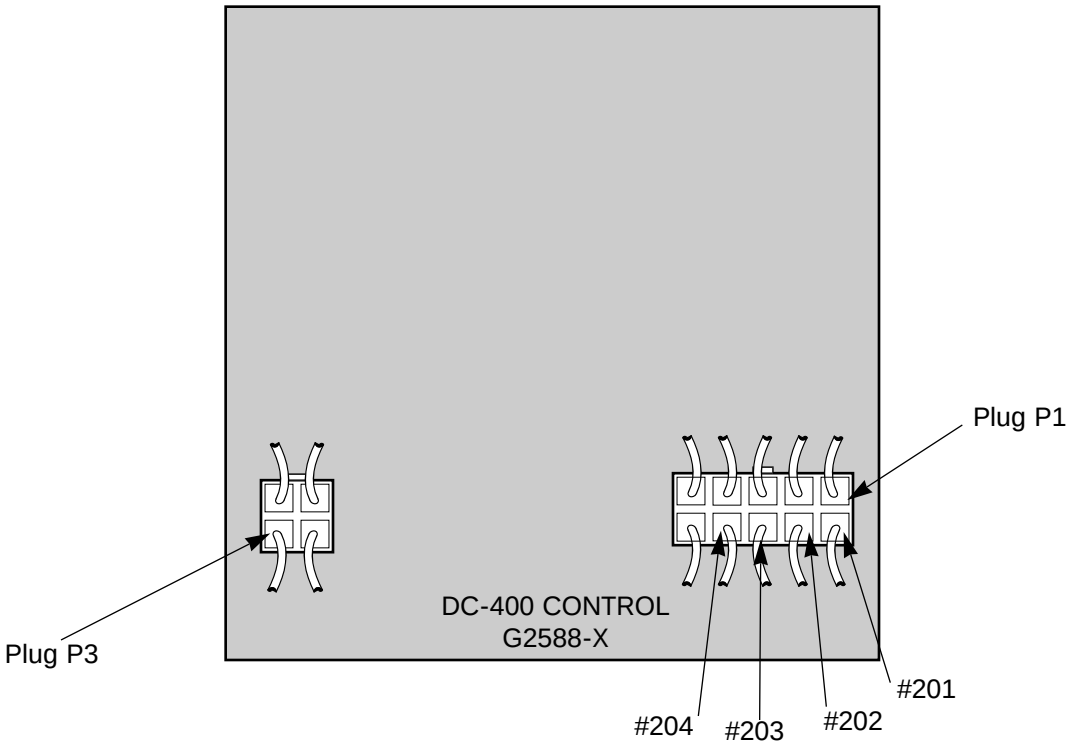
    b. If one or more of the voltage tests are incorrect, check for loose or faulty wiring.

    c. If the wiring is good, then the main transformer may be faulty. Replace the main transformer.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.8 – CONTROL BOARD PLUG P1 LOCATION



Plug P1 PHASE ANGLE WINDING VOLTAGES

From Lead #	To Lead #	Expected VAC
201	204	21 VAC
202	204	21 VAC
203	204	21 VAC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STATIC SCR/DIODE RECTIFIER BRIDGE TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

This test will help determine if an SCR or diode is shorted or “leaky.” See the Machine Waveform Section in this manual for normal and abnormal output waveforms.

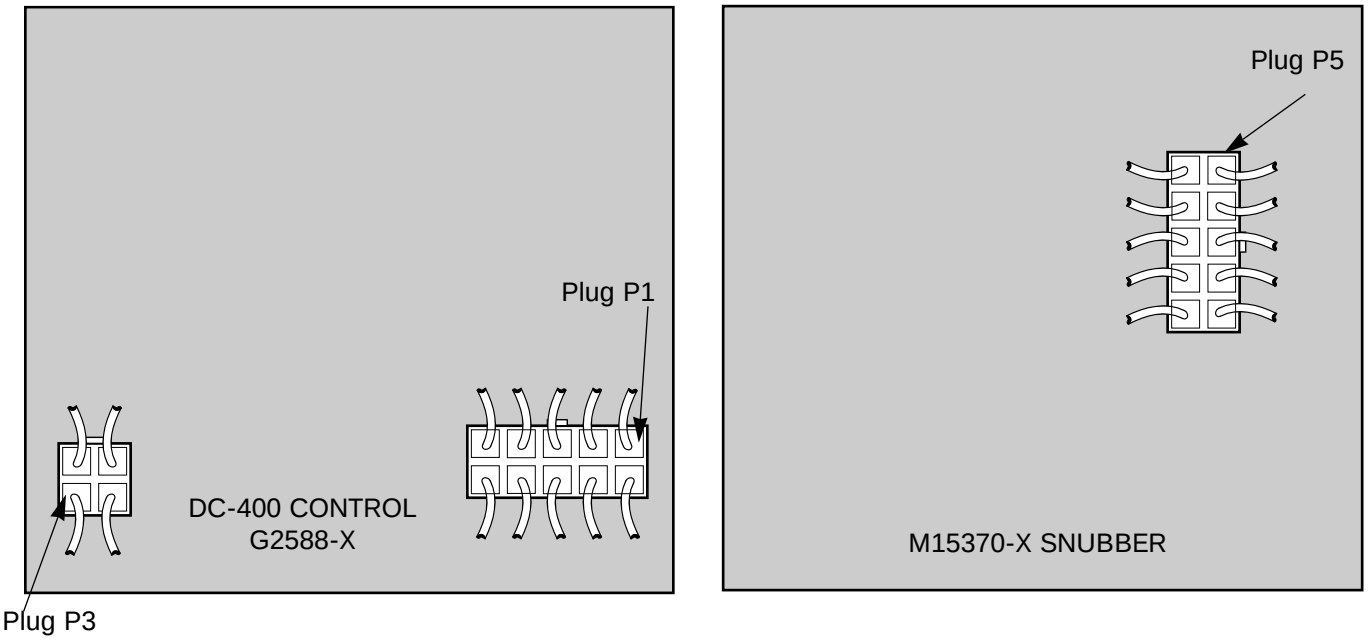
MATERIALS NEEDED

Analog Volt/Ohmmeter (Multimeter)
5/16” Nut driver
Idealarc DC-400 Wiring Diagrams (See the Electrical Diagrams section of this manual.)

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STATIC SCR/DIODE RECTIFIER BRIDGE TEST *(continued)*

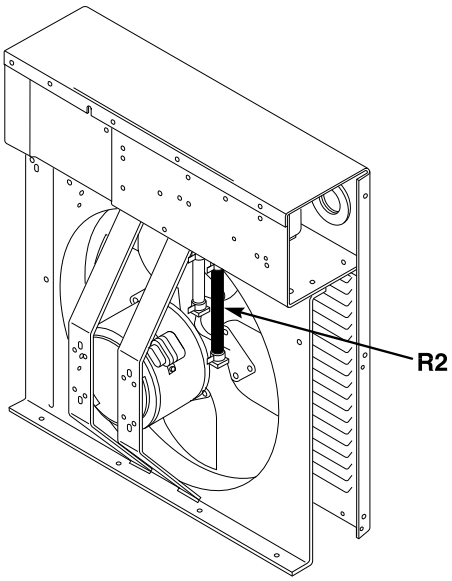
FIGURE F.9 – CONTROL BOARD AND SNUBBER BOARD PLUG LOCATIONS



TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides.
3. Disconnect the welding cables from the welding output terminals.
4. Locate and remove molex plugs P1 and P3 from the control board. See Figure F.9.
5. Locate and remove molex plug P5 from the snubber board. See Figure F.9.
6. Rotate the mode switch (S4) to the constant current (CC) position.
7. Locate and remove lead #204 from resistor R2 (40 ohms, 50 Watts). See Figure F.10.

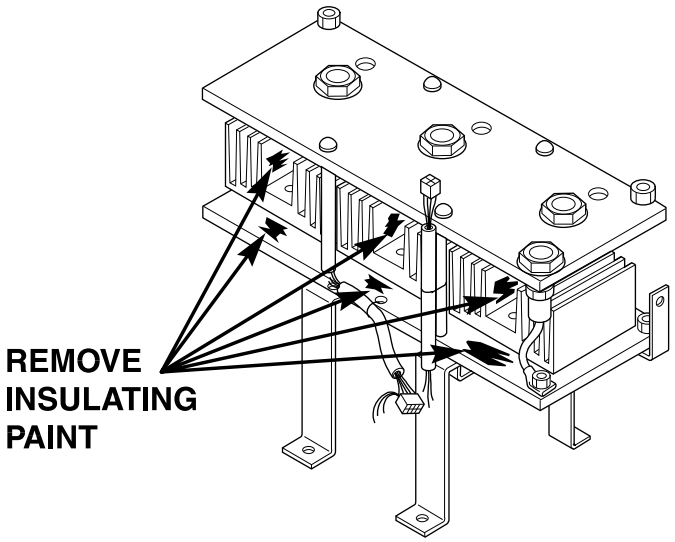
FIGURE F.10 – RESISTOR R2 LOCATION



Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STATIC SCR/DIODE RECTIFIER BRIDGE TEST *(continued)*

FIGURE F.11 – HEAT SINK AND SCR TEST POINTS



8. Remove the red insulating paint from the heat sink test points. See Figure F.11.

   NOTE: Do not disassemble the heat sink.

9. Measure the resistance from the anode to the cathode of SCR 1 using an analog volt/ohmmeter (multimeter) set at R x 1000 scale. See Figure F.11.

   a. Reverse the meter leads and measure the resistance from the cathode to the anode of SCR 1. See Figure F.11.

   b. If a low resistance is measured in either meter polarity, SCR1 is faulty. Replace SCR 1.

10. Test the resistance of SCR 2 and SCR 3 using the same procedure described in Step 9.

11. Measure the resistance of diode D1 from anode (+probe) to cathode (-probe) using an analog ohmmeter set at R x 1000 scale. The resistance should be low. See Figure F.11.

    a. Reverse the meter leads and measure the resistance from cathode (+probe) to anode (-probe) of diode D1. The resistance should be high. See Figure F.11.

    b. If a low resistance is measured in both meter polarities, diode D1 is shorted. Replace diode D1.

    c. If a high resistance is measured in both meter polarities, diode D1 is open. Replace diode D1.

12. Test diodes D2, D3 and D4 for proper operation using the same procedure described in Step 11.

13. Reconnect all leads and molex plugs.

14. If this test did not identify the problem or to further test the SCRs, go to the ***Active SCR Test.***

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

This test will help determine if the device can be gated ON and conduct current from anode to cathode.

MATERIALS NEEDED

An SCR tester as specified in this procedure.
5/16” Nut driver
Idealarc DC-400 Wiring Diagrams (See the Electrical Diagrams section of this manual.)

ACTIVE SCR TEST *(continued)*

FIGURE F.12 – CONTROL BOARD PLUG P1 AND P3 LOCATIONS

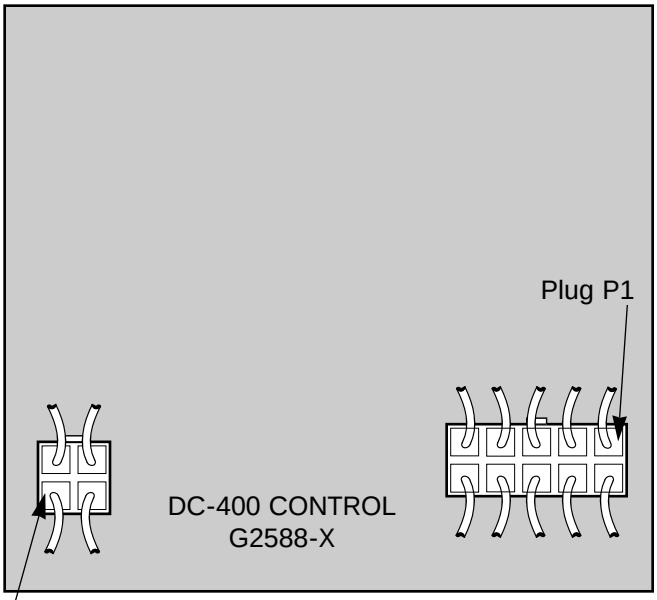


FIGURE F.13 – SNUBBER BOARD PLUG P5 LOCATION

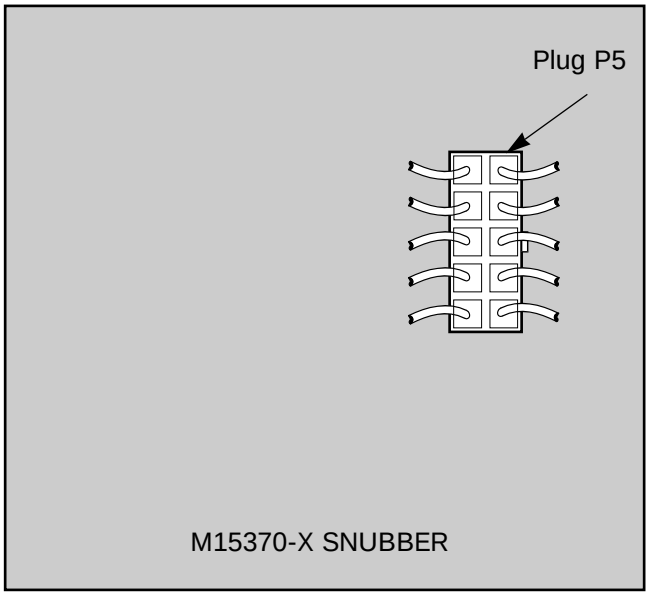
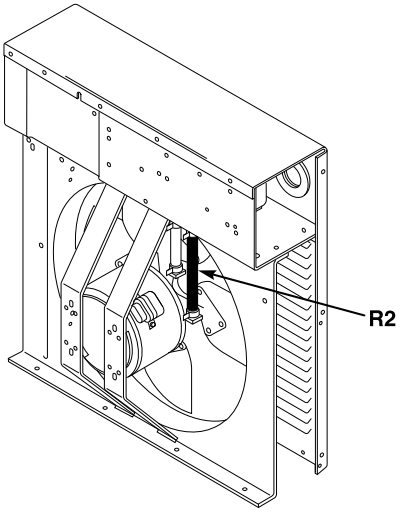


FIGURE F.14 – RESISTOR R2 LOCATION



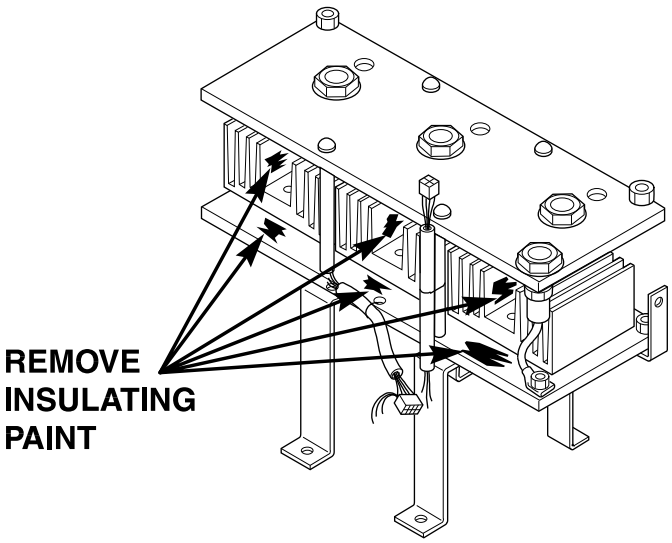
TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16” nut driver, remove the case top and sides. Remove the screws holding the front panel and lower the panel.
3. Disconnect the welding cables from the welding output terminals.
4. Locate and remove molex plugs P1 and P3 from the control board. See Figure F.12.
5. Locate and remove molex plug P5 from the snubber board. See Figure F.13.
6. Rotate the mode switch (S4) to the constant current (CC) position.
7. Locate and remove lead #204 from resistor R2 (40 ohms, 50 Watts). See Figure F.14.

Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST *(continued)*

FIGURE F.15 – HEAT SINK TEST POINTS



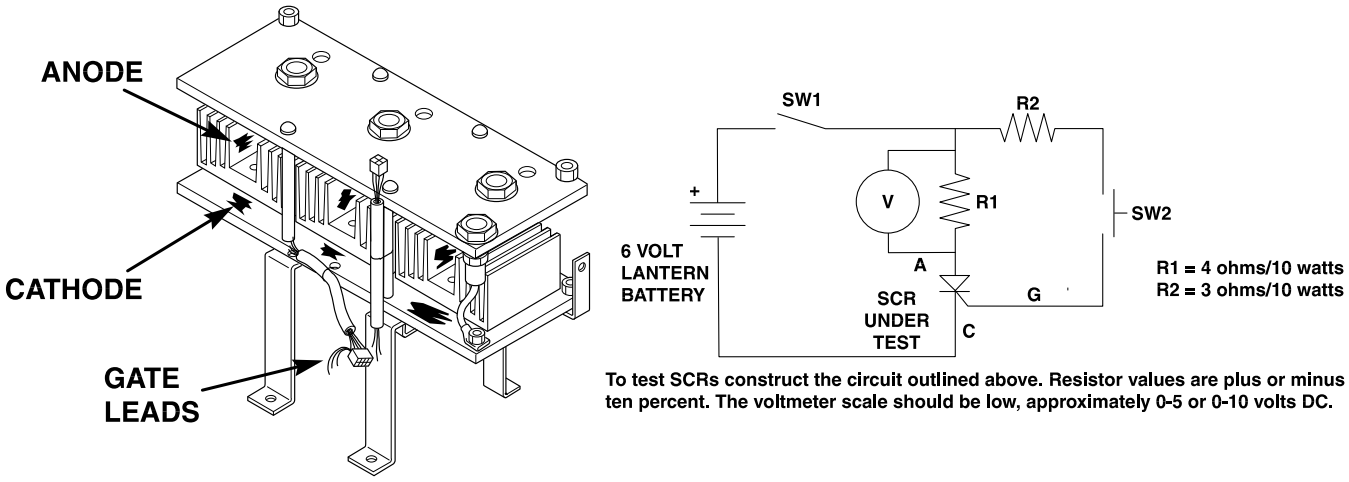
8. Remove the red insulating paint from the heat sink test points. See Figure F.15.

   NOTE: Do not disassemble the heat sinks.

Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST *(continued)*

FIGURE F.16 – SCR TESTER CIRCUIT AND SCR CONNECTIONS



To test SCRs construct the circuit outlined above. Resistor values are plus or minus ten percent. The voltmeter scale should be low, approximately 0-5 or 0-10 volts DC.

9. Construct the circuit shown in Figure F.16. One 6-volt lantern battery can be used., Set voltmeter scale low, at approximately 0-5 volts or 0-10 volts.
10. Test the voltage level of the battery. Short leads (A) and (C). Close switch SW-1. Battery voltage should be 4.5 volts or higher. If lower, replace the battery.
11. Connect the tester to the SCR 1 as shown in Figure F.16.
    a. Connect tester lead (A) to the anode.
    b. Connect tester lead (C) to the cathode.
    c. Connect tester lead (G) to the gate.
12. Close switch SW-1.

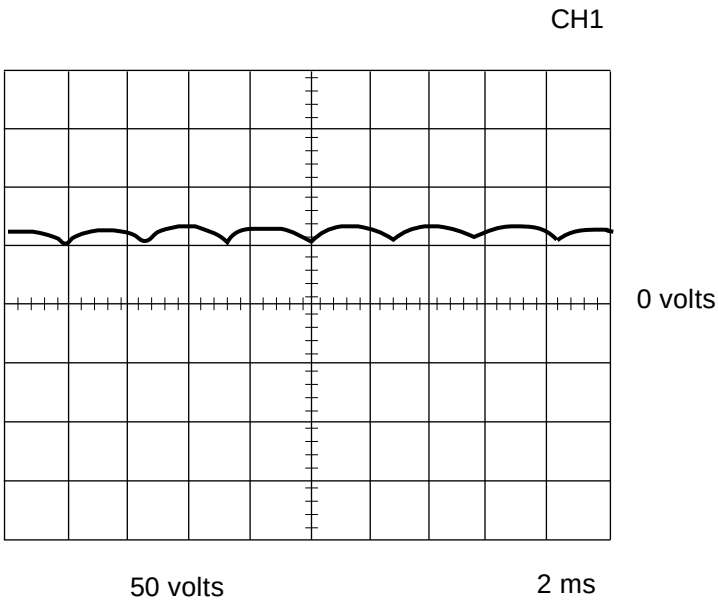
    NOTE: Switch SW-2 should be open.
13. Read meter for zero voltage.
    a. If the voltage reading is higher than zero, the SCR is shorted.
14. Close or keep closed switch SW-1.
15. Close switch SW-2 for 2 seconds. Release and read meter.
    a. If the voltage is 3-6 volts while the switch is closed and after the switch is open, the SCR is functioning.
    b. If the voltage is 3-6 volts only when the switch is closed or if there is no voltage when the switch is closed, the SCR is defective.

    NOTE: Be sure the battery is functioning properly. A low battery can affect the results of the test. Repeat Battery Test Procedure in Step 10 if needed.
16. Open switch SW-1.
17. Reconnect the tester leads. See Figure F.16.
    a. Connect tester lead (A) to the cathode.
    b. Connect tester lead (C) to the anode.
    c. Disconnect test lead (G) from the gate.
18. Close switch SW-1.
19. Read meter for zero voltage.
    a. If the voltage is zero, the SCR is functioning.
    b. If the voltage is higher than zero, the SCR is shorted.
20. Perform the Active Test Procedure outlined in Steps 11-19 for SCRs 2 and 3.
21. Replace all SCR assemblies that do not pass the above tests.
22. Replace all molex plugs onto the control board and snubber board. Reconnect lead #204 to resistor R2.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT CURRENT MODE – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

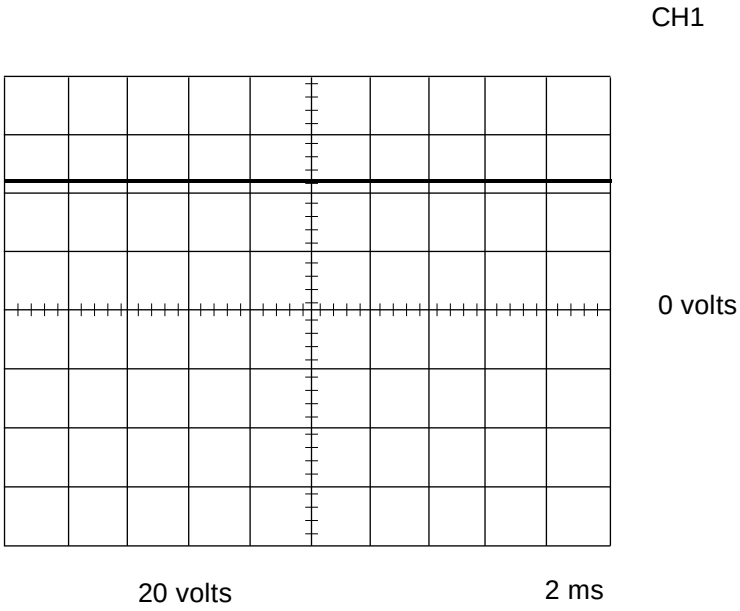
Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT VOLTAGE FCAW/GMAW

MAXIMUM OUTPUT SETTING – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

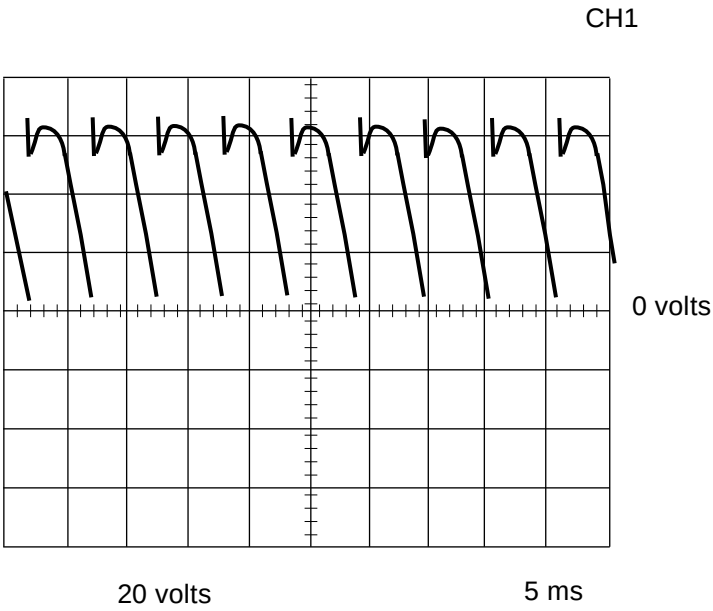
SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT VOLTAGE SUBARC
MAXIMUM OUTPUT SETTING – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 5 milliseconds in time.

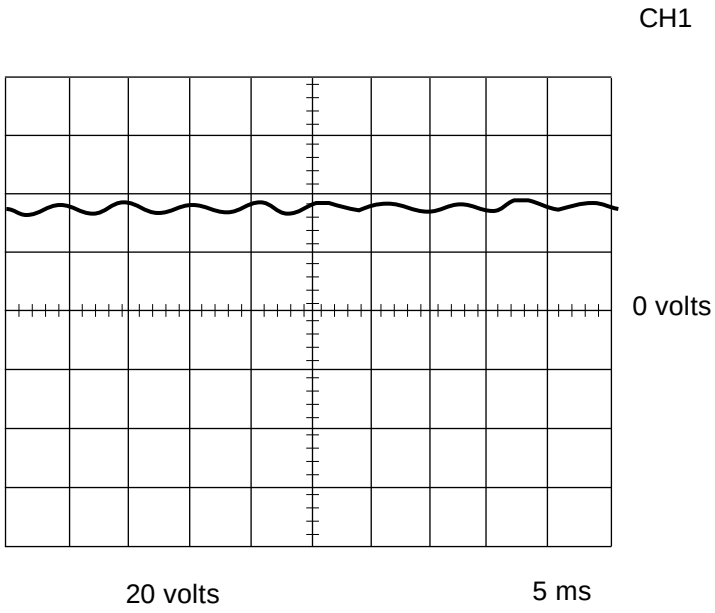
Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC

TYPICAL OUTPUT VOLTAGE WAVEFORM – MACHINE LOADED CONSTANT VOLTAGE FCAW/GMAW MODE



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 5 milliseconds in time. The machine was loaded with a resistance grid bank. The DC-400 meters read 400 amps at 36 VDC.

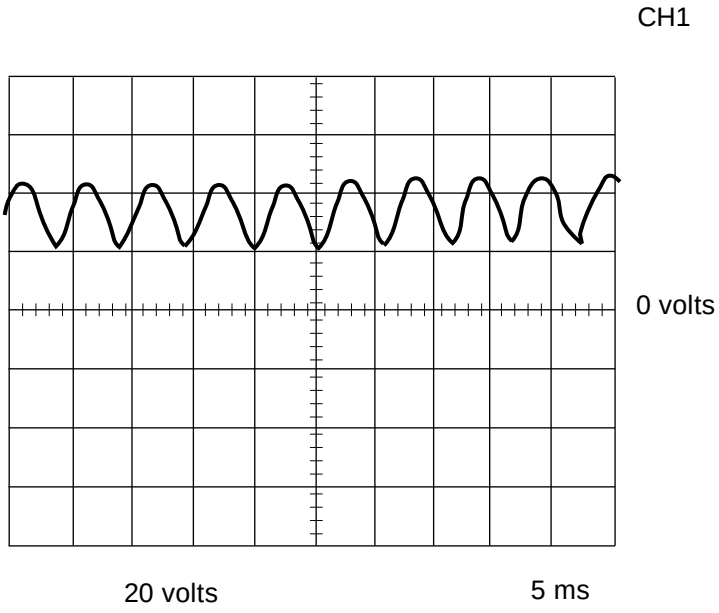
Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC

TYPICAL OUTPUT VOLTAGE WAVEFORM – MACHINE LOADED CONSTANT VOLTAGE SUBARC MODE



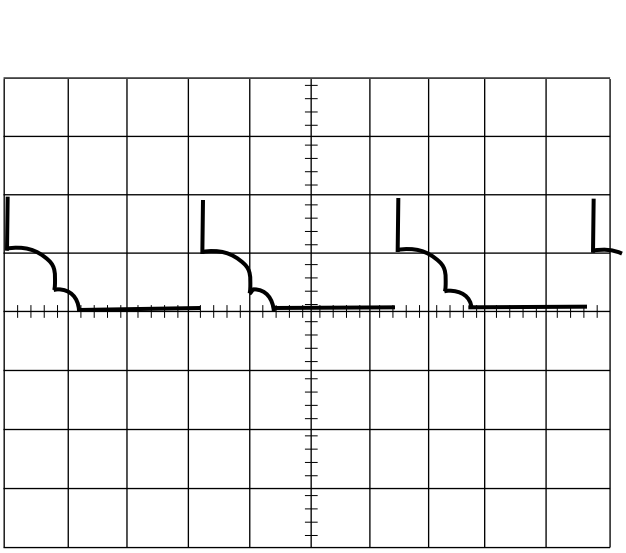
This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 5 milliseconds in time. The machine was loaded with a resistance grid bank. The DC-400 meters read 400 amps at 36 VDC.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

TYPICAL SCR GATE VOLTAGE WAVEFORM
CONSTANT VOLTAGE SUBARC
MAXIMUM OUTPUT SETTING – NO LOAD



This is the typical SCR gate pulse voltage waveform. The machine was in an open circuit condition (no load) and operating properly. Note that each vertical division represents 2 volts and that each horizontal division represents 5 milliseconds in time.

Note: Scope probes connected at SCR gate and cathode: (+) probe to gate, (-) probe to cathode.

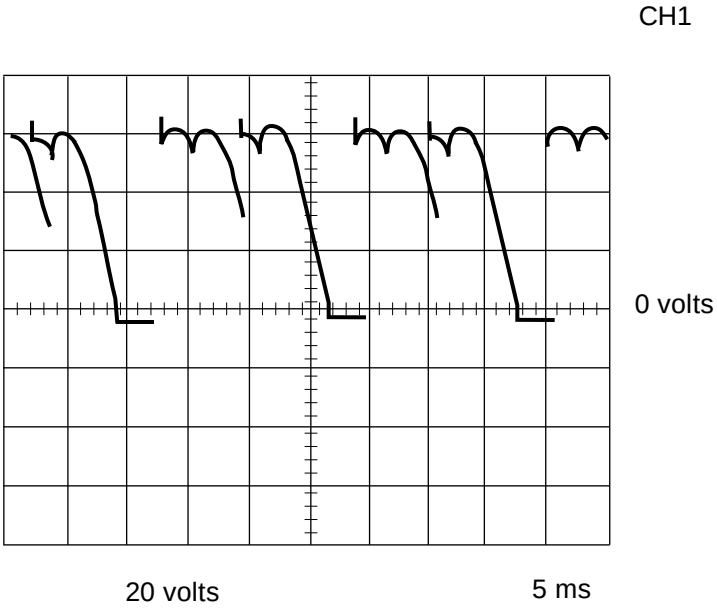
SCOPE SETTINGS

Volts/Div	2V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

ABNORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT VOLTAGE SUBARC
ONE OUTPUT SCR NOT FUNCTIONING



This is NOT the typical DC output voltage waveform. One output SCR is not functioning. Note the “gap” in the waveform. One SCR gate is disconnected to simulate an open or non-functioning output SCR. Each vertical division represents 20 volts and each horizontal division represents 5 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in inspecting, cleaning, and replacing the input contactor.

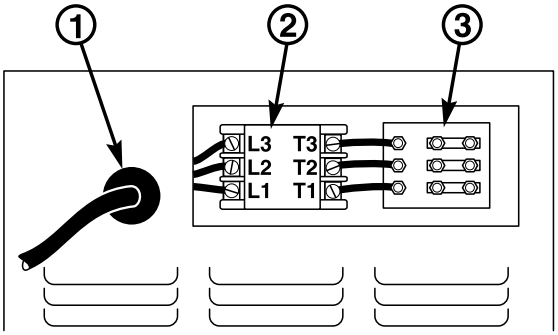
MATERIALS NEEDED

Phillips head screwdriver
5/16” socket wrench
Flat heat screw driver
Low pressure air source

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT *(continued)*

FIGURE F.17 – INPUT CONTACTOR CLEANING AND REMOVAL



1. INPUT SUPPLY LINE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

CLEANING PROCEDURE

1. Remove the main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.17.
3. Remove the input contactor cover plate using a phillips head screwdriver.

⚠ WARNING

Do not apply input power to the machine with the input contactor cover plate removed.

4. Blow out any dirt or dust in or around the contacts with a low pressure air stream.
5. Inspect the contacts for signs of excessive wear, pitting, or contacts fused (stuck) together.
   a. If any of these conditions are present, replace the input contactor assembly.
6. Replace the input contactor cover plate.

CONTACTOR REPLACEMENT PROCEDURE

1. Disconnect main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.17.
3. Disconnect the main input supply power leads L1, L2, and L3 to the input contactor.

   Remove the control transformer primary leads H1, H2 or H3 (dependent on input voltage) from L1 and L3 terminals on the input side of the contactor.
4. Disconnect the output leads T1, T2, and T3 from the input contactor.
5. Identify and label the leads connected to the input contactor coil. See the Wiring Diagram.
6. Disconnect the leads from the input contactor coil (leads X1, #232 and #233). See the Wiring Diagram.
7. Remove the three self-tapping mounting screws using a 5/16” socket wrench. See Figure F.17.
8. Remove the input contactor.
9. Insert the replacement input contactor and install it following the procedures in reverse order.

   NOTE: Be sure to reconnect all leads correctly.

Return to Section TOC
Return to Master TOC

FAN MOTOR AND BLADE REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in gaining access to the fan blade and fan motor for maintenance or replacement.

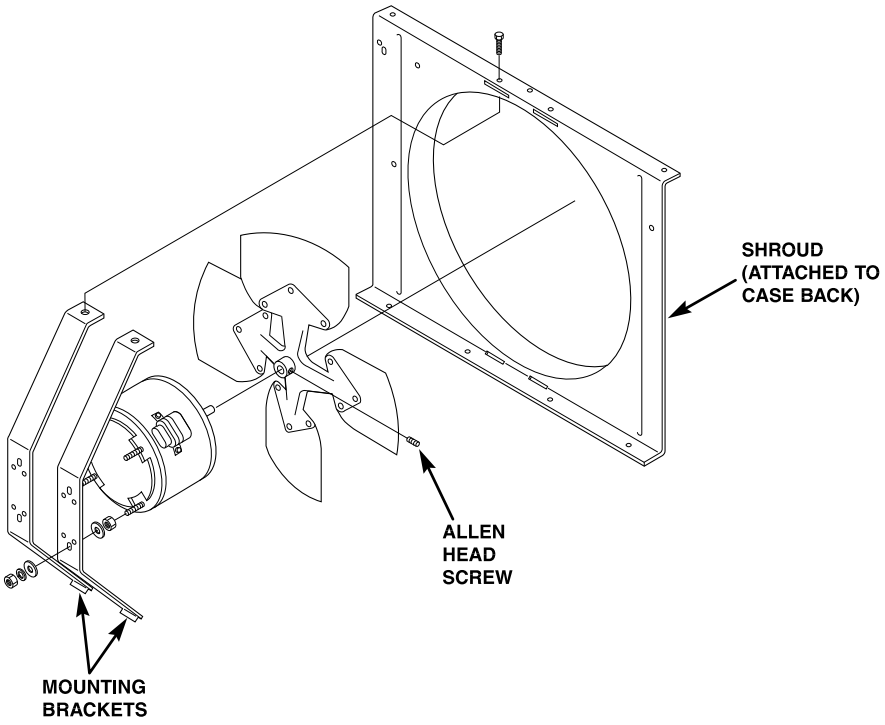
MATERIALS NEEDED

5/16” Nut driver
3/8” Wrench
Allen head type wrench

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FAN MOTOR AND BLADE REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.18 – FAN MOTOR MOUNTING DETAILS



PROCEDURE

1. Remove the main input supply power to the machine.
2. Using the 5/16” nut driver, remove the case top and sides.
3. The fan blade can be removed using the Allen head wrench.

   NOTE: You may need to loosen the machine case back to gain clearance to remove the fan. See Figure F.18.
4. If the fan motor is to be removed, the leads to the motor must be disconnected. This will require cutting the wires or “breaking the splice.”
5. Remove the four mounting nuts and associated flat and lock washers that hold the motor to the mounting bracket. See Figure F.18.
6. Carefully remove the fan motor.
7. To replace the fan motor, mount the motor to its mounting bracket using the four nut and associated flat and lock washers.
8. Resplice any motor leads cut for removal. Soldering the wires is recommended.
9. Reattach the fan blade, if it was removed earlier, using the Allen head wrench to tighten it to the motor shaft.
10. Install the case top and sides.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

SCR/DIODE RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in the removal and replacement of the SCR/diode assembly.

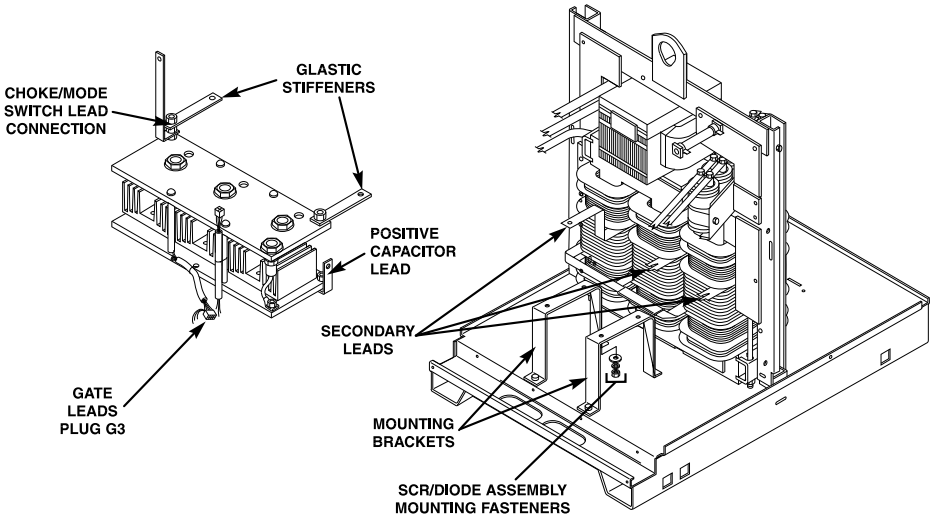
MATERIALS NEEDED

5/16” Nut driver
7/16” Wrench
1/2” Wrench
9/16” Wrench
3/8” Wrench
Slot head screw driver
1/2” Socket and extension

Return to Section TOC
Return to Master TOC

SCR/DIODE RECTIFICER ASSEMBLY REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.19 – SCR/DIODE ASSEMBLY DETAILS



PROCEDURE

1. Remove the main input supply power to the machine.
2. With the 5/16” nut driver, remove the case top and sides.
3. Remove the glastic stiffeners (one on each side-left and right). See Figure F.19.
4. Remove the positive capacitor lead and shunt from the positive heat sink plate. See Figure F.19.
5. Remove the choke and mode switch lead from the left side of the negative heat sink plate. See Figure F.19.
6. Remove the gate leads from the control board (plug P3).
7. Remove plug P5 from the snubber board. Also remove lead #224 from the positive output lead. Remove lead #225 from the negative output lead. Remove the green ground lead from the front panel.
8. Remove the three heavy aluminum secondary leads from the SCR finned heat sinks.
9. Remove the four nuts and associated washers that hold the SCR/diode assembly to the mounting brackets.
10. Carefully lift and remove the SCR/diode heat sink assembly from the machine. Note: It may be necessary to loosen the six sheet metal screws that hold the front panel to the base. Carefully lift and pull out the front panel to allow clearance for SCR/diode assembly removal. Clear any necessary leads that might hinder removal.
11. For reassembly, carefully place the SCR/diode assembly into position on the mounting bracket and reinstall the washers and nuts. Tighten the front panel to base if it was loosened earlier.
12. Replace and tighten the four nuts and lockwashers that hold the SCR/diode assembly to the mounting brackets.
13. Reattach the three heavy aluminum secondary leads to the SCR finned heat sinks. Apply a thin coating of Dow Corning 340 heat sink compound (Lincoln E1868) to connection points.
14. Connect the green ground lead to the front panel, lead #225 to the negative output lead, and lead #224 to the positive output lead.
15. Connect plug P5 to the snubber board and plug P3 to the control board.
16. Connect the choke and mode switch lead to the left side of the negative heat sink plate. See Figure F.19.
17. Connect the positive capacitor lead and shunt to the positive heat sink plate. See Figure F.19.
18. Install the glastic stiffeners to the left and right sides. See Figure F.19.
19. Install the case top and sides.

SCR REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in removing the SCRs from the output rectifier heat sink for maintenance or replacement.

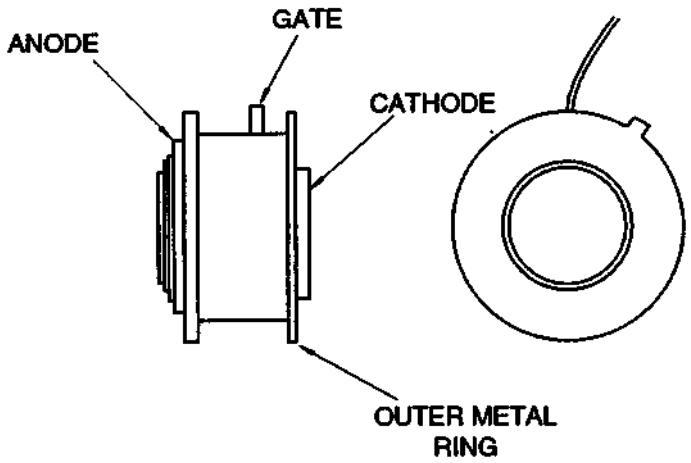
MATERIALS NEEDED

NO.000 Fine Steel Wool
Penetrox A-13 (Lincoln E2529) or Penetrox A
7/16” Open end wrench
Allen head type wrenches

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCR REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.20 – SCR DETAILS



SPECIAL INSTRUCTIONS

NOTE: Before disassembling the existing rectifier, note toward which heat sink the outer metal ring of the power SCR is mounted. Also, note the positioning of the gate lead of the SCR. Failure to reinstall the new SCR in the same orientation as the original may result in subsequent damage to the new SCR and other components of the welder. See Figure F.20.

⚠ CAUTION

The unclamping and clamping procedure outlined below is critical for the prevention of internal SCR damage. Failure to follow this procedure may result in subsequent damage of the SCR. Handle all SCRs with care.

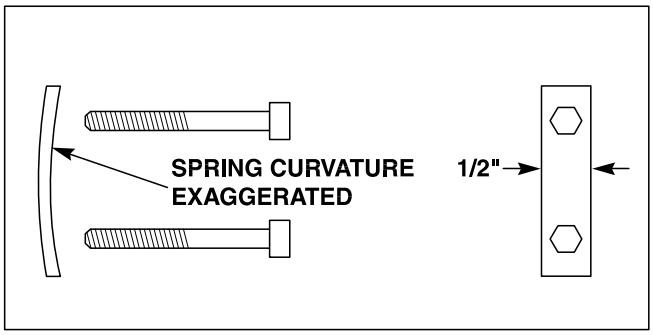
PROCEDURE

1. Remove the main input supply power to the machine.
2. Perform the ***SCR/Diode Rectifier Assembly Removal and Replacement*** procedure.
3. Alternately loosen nuts 1/2 turn each until heat sinks are loose. Remove nuts and leaf spring. IT IS RECOMMENDED THAT NEW HARDWARE, LEAF SPRING AND HOUSING BE USED FOR REASSEMBLY.
4. Remove the old SCR.
5. Clean the area on the heat sink around the SCR mounting surface, using a putty knife or similar tool. DO NOT SCRATCH THE SCR MOUNTING SURFACE.
6. Polish each heat sink's mounting surface using NO. 000 fine steel wool. Wipe surface clean with a lint-free cloth or paper towel.
7. Inspect the mounting surfaces of each new SCR.
   a. Remove all burrs and wipe clean. Do not use steel wool or any abrasive cleanser on the SCR mounting surfaces.
8. Apply a thin (0.001" to 0.003") layer of PENETROX A-13 (Lincoln Electric #E2529) or PENETROX A, heat sink compound, to each heat sink's SCR mounting surface.
   a. Care must be used to prevent foreign material contamination of the SCR to heat sink junction.
9. Place the new SCR between the heat sinks. Be sure that the outer metal ring of the SCR is facing toward the same heat sink as the old SCR's metal ring. Be sure that the roll pin of the heat sink engages the "hole" in the SCR. The SCR contact surfaces must sit flat against both heat sink surfaces.

Return to Section TOC
Return to Master TOC

SCR REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.21 – 1/2" WIDE LEAF SPRING

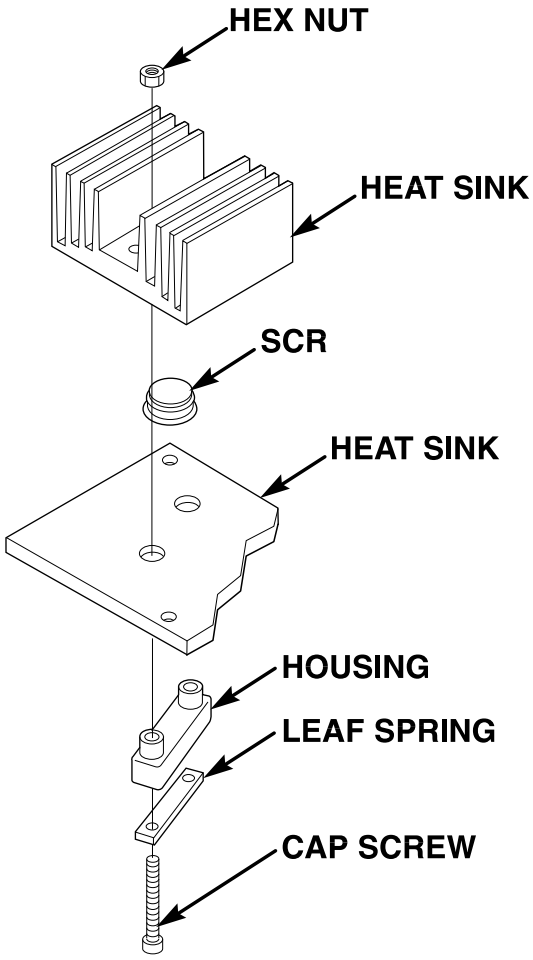


10. Go to the procedure below that matches your machine's cap screws. NOTE WHICH THREAD IS ON YOUR CAP SCREWS BEFORE PROCEEDING TO THE ASSEMBLY PROCEDURE. Two different designs of leaf springs and housings have been used to clamp the SCR to the rectifier. The two different designs can be identified by the size of the leaf spring. One design uses a 1/2 inch wide leaf spring, and the other uses a 5/8 inch wide spring. The different designs require different assembly and clamping procedures. The assembly procedure will be different depending upon the thread on the cap screws. A 1/4-28 thread requires a different tightening procedure than a 1/4-20 thread.

PROCEDURE FOR THE 1/2 INCH WIDE SPRING

1. Place a piece of sleeving around each cap screw.
2. Insert cap screws through the leaf spring. Orient the leaf spring so that its ends are curved upward toward the cap screw heads. See Figure F.21. Pressing on the cap screw heads should produce a "rocking" motion of the spring in its housing. If the spring does NOT rock, it is installed upside down. Remove the spring and turn it over. Check for "rocking" motion. See Figure F.21.
3. Insert cap screws and leaf spring into the plastic housing.
4. Insert clamp assembly through heat sinks. Install nuts. Tighten clamp nuts equally on cap screws until finger tight. (See Figure F.22. Heat sinks may not be exactly as pictured.)
5. Reinspect the SCR for proper seating.

FIGURE F.22 – CLAMP ASSEMBLY



Return to Section TOC
Return to Master TOC

SCR REMOVAL AND REPLACEMENT *(continued)*

CLAMPING PROCEDURE FOR 1/4-28 CAP SCREWS

NOTE: This procedure can only be used with 1/4-28 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/2 turn.
6. Tighten first cap screw 1/4 turn. Stop.
7. Assembly now has the proper clamping force.
8. Perform the ***Active SCR Test.***

CLAMPING PROCEDURE FOR 1/4-20 CAP SCREWS

NOTE: This procedure can only be used with 1/4-20 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

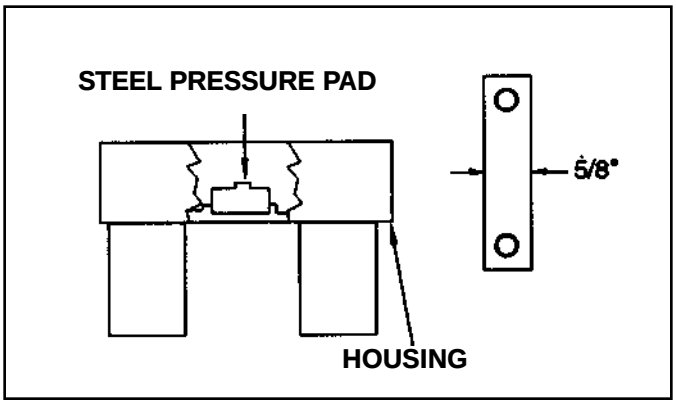
Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/4 turn. STOP.
6. Assembly now has the proper clamping force.
7. Perform the ***Active SCR Test.***

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCR REMOVAL AND REPLACEMENT *(continued)*

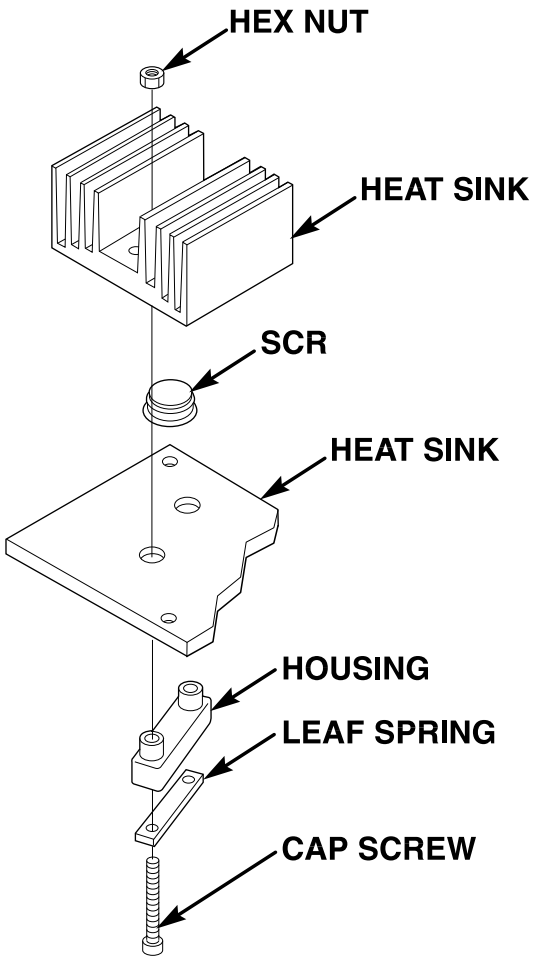
FIGURE F.23 – HOUSING AND PRESSURE PAD FOR 5/8" WIDE LEAF SPRING



PROCEDURE FOR THE 5/8 INCH WIDE SPRING

1. Place a piece of sleeving around each cap screw.
2. Insert cap screws through the leaf spring. The leaf spring is flat so the orientation of the leaf spring does not matter.
3. Place the steel pressure pad in the housing with the 1/8 inch wide standoff facing up. See Figure F.23.
4. Insert cap screws and leaf spring into plastic housing being sure that the steel pressure pad remains in position. Pressing on the cap screw heads should produce a rocking action of the spring in its housing.
5. Insert the clamp assembly through the heat sinks. Install nuts. Tighten the clamp nuts equally on the cap screws until finger tight. Be sure that the leaf spring is not cocked in the housing. See Figure F.24. Heat sinks may not be exactly as pictured.
6. Reinspect the SCR for proper seating.

FIGURE F.24 – CLAMP ASSEMBLY



Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

SCR REMOVAL AND REPLACEMENT *(continued)*

CLAMPING PROCEDURE FOR 1/4-28 CAP SCREWS

NOTE: This procedure can only be used with 1/4-28 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/2 turn.
6. Tighten first cap screw 1/2 turn.
7. Tighten second cap screw 1/4 turn. STOP.
8. Assembly now has the proper clamping force.
9. Perform the ***Active SCR Test.***

AFTER REPLACING THE SCRs

Follow the steps in the ***SCR/Diode Rectifier Removal and Replacement*** procedure to reassemble the machine.

CLAMPING PROCEDURE FOR 1/4-20 CAP SCREWS

NOTE: This procedure can only be used with 1/4-20 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/4 turn.
6. Tighten first cap screw 1/8 turn.
7. Tighten second cap screw 1/8 turn. STOP.
8. Assembly now has the proper clamping force.
9. Perform the ***Active SCR Test.***

MOUNTING OF STUD TYPE DIODES TO ALUMINUM HEAT SINKS

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in mounting stud type diodes to the aluminum heat sinks on the DC-400.

MATERIALS NEEDED

5/16” Nut driver
1/2” Open end wrench
Lincoln E1868 (Dow Corning 340) Heat Sink Compuond
“Slip” type torque wrench
No. 000 fine steel wool

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

MOUNTING OF STUD TYPE DIODES TO ALUMINUM HEAT SINKS *(continued)*

PROCEDURE

1. Remove the main input supply power to the machine.
2. With the 5/16” nut driver, remove the case top and sides.
3. Loosen the appropriate diode nut and remove the diode that is to be replaced.
4. Clean the area on the heat sink around the diode mounting surface using a putty knife or similar tool. DO NOT SCRATCH THE DIODE MOUNTING SURFACE.
5. Polish each heat sink’s mounting surface using No. 000 fine steel wool. Wipe the surface clean with a lint-free cloth or paper towel.
6. Inspect the mounting surfaces of each new diode. Remove all burrs and wipe clean. Do not use steel wool or any abrasive cleanser on the diode mounting surface.
7. Apply a thin (0.003” to 0.007”) uniform layer of E1868 (Dow Corning 340) heat sink compound to the heat sink mounting surface.
   a. Do not apply compound to the diode stud or mounting threads.
   b. The diode threads must be clean and free of defects so that the nut can be finger tightened before applying torque. A “slip” type torque wrench must be used to tighten the diode nut.
8. Tighten the diode nuts to the specifications in the following table.
   a. Start the nuts for diodes with steel studs by hand and then torque them according to the following table.
   b. Run the nuts for diodes with copper studs on all the way by hand then torque them according to the following table.
   c. Turn the nuts a minimum of 1/2 turn more while torquing.
9. Install the case top and sides.

DIODE STUD SIZE	FOOT-POUNDS	INCH-POUNDS
3/4-16	25-27	300-324
3/8-24	10±.5	125+0/-5
1/4-28		22-25

MAIN TRANSFORMER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in removing the main transformer for maintenance or replacement.

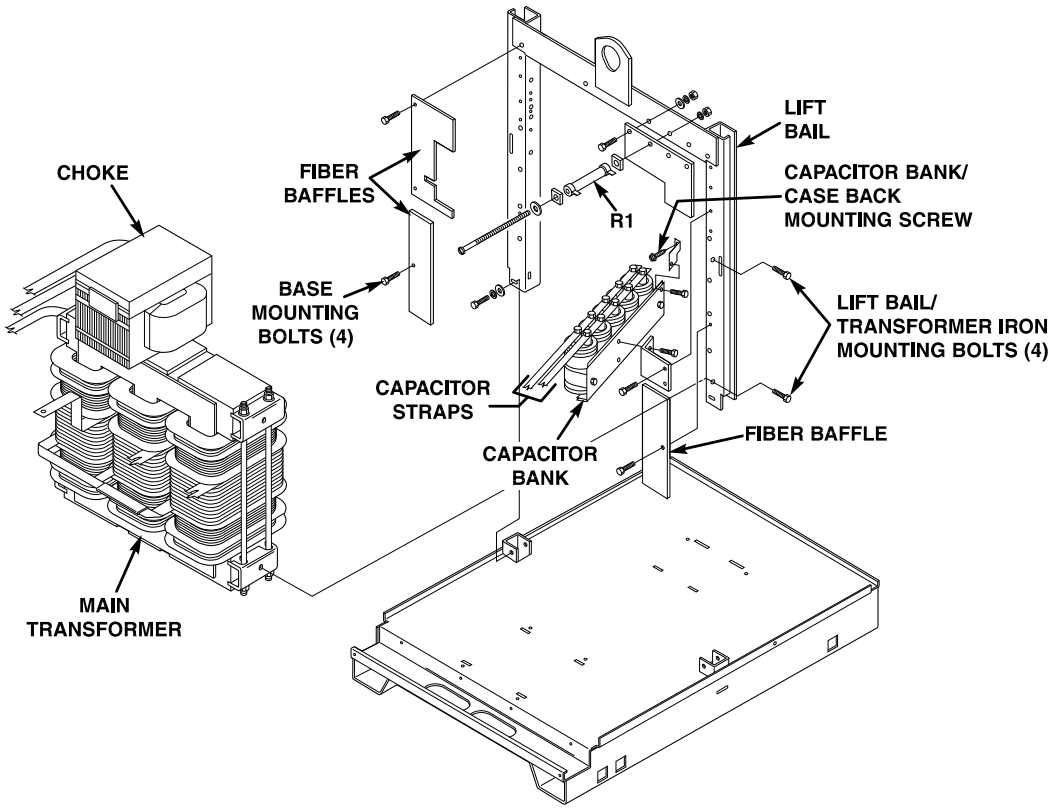
MATERIALS NEEDED

5/16” Nut driver
9/16” Socket wrench
9/16” Box end wrench
1/2” Socket wrench
1/2” Box end wrench
3/8” Nut driver or socket wrench
9/16” Deep well socket wrench

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

FIGURE F.25 – LIFT BAIL REMOVAL



REMOVAL OF LIFT BAIL

1. Remove the main input supply power to the machine.
2. With the 5/16” nut driver, remove the case top and sides.
3. Remove the two fiber baffles from the left and right sides of the lift bail adjacent to the main transformer. See Figure F.25.
4. Remove the fiber baffle from the left side of the choke.
5. Remove the two leads from resistor R1 (15 ohms, 100 watts).
6. Remove the positive capacitor strap from the output shunt.
7. Remove the negative capacitor strap from the mode selector switch.
8. Remove lead #204 from resistor R2 (40 ohms, 50 watts) located on case back.
9. Remove leads #204 and #227 from resistor R3 (7.5 ohms, 100 watts) located on case back.
10. Remove the sheet metal screw that holds the capacitor bank assembly to the case back. (This should enable the capacitor bank to be removed with the lift bail assembly.)
11. Using the 9/16” socket wrench, remove the four bolts (left and right) mounting the lift bail to the transformer top and bottom irons.
12. Using the 9/16” socket wrench, remove the four bolts, flat washers, and lock washers mounting the lift bail assembly to the base of the machine.

⚠ WARNING

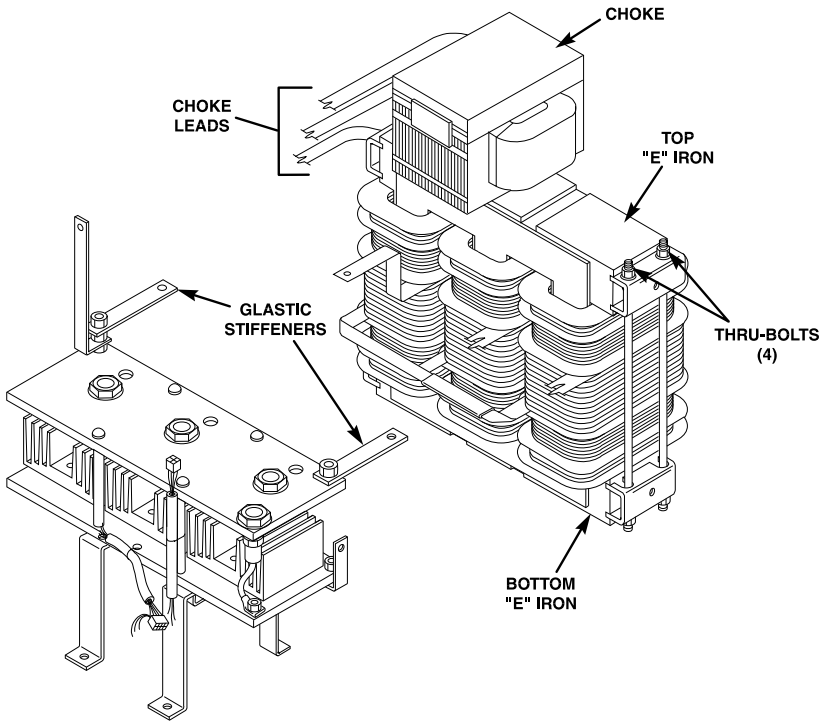
The transformer and choke assembly is now loose and free to slide or “tip” on the base of the machine.

13. Remove the lift bail by lifting straight up and clear from the machine.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

FIGURE F.26 – CHOKE REMOVAL



REMOVAL OF CHOKE AND TOP IRON ASSEMBLY

1. Remove the two (left and right) glastic stiffeners connecting the negative rectifier plate and choke assembly to the main transformer thru-bolts. See Figure F.26.
2. Remove the top and center choke leads from the mode selector switch.
3. Remove the bottom choke lead from the negative rectifier plate.
4. Label and cut or desolder the choke control coil leads that are soldered to the arc control switch. Cut any necessary cable ties.
5. Using the 9/16” deep well socket wrench, remove the four thru-bolts that clamp the top “E” iron and choke assembly to the bottom “E” iron. NOTE: for easier reassembly, clean the threads.
6. Using a hoist, carefully lift the choke and top iron assembly out and clear of the transformer coils.

NOTE: The coils may be “stuck” to the top iron and may require some careful prying to dislodge them. Depending upon which coil(s) are to be replaced, it may be advantageous to remove some of the “stuck” coils with the top iron.

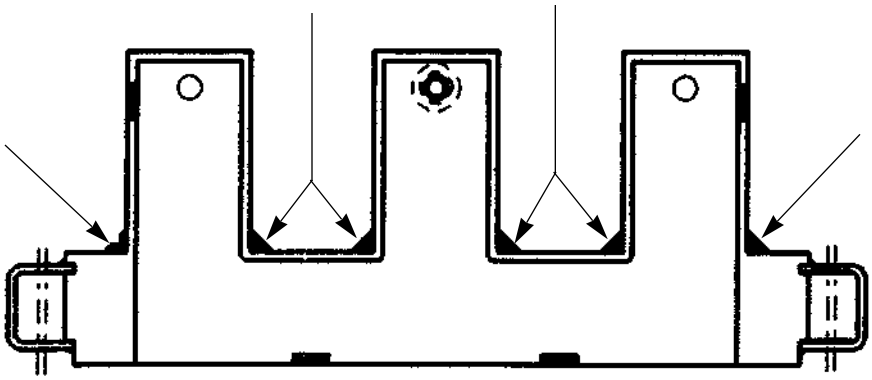
7. The leads from the coils that are to be removed and/or replaced must be disconnected. See the Wiring Diagram.

When aluminum leads are re-connected, apply a thin layer of Dow Corning 340 Heat Sink Compound (Lincoln E1868) to mating surfaces.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

FIGURE F.27 – EPOXY MIX APPLICATION AREAS



REASSEMBLY OF TRANSFORMER COILS

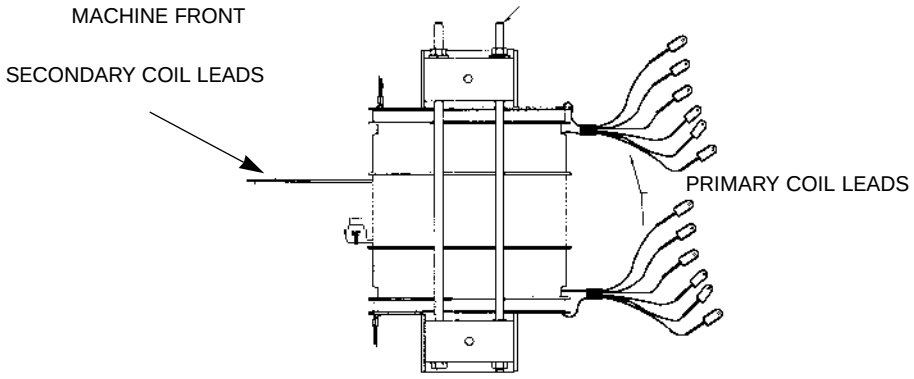
NOTE: The following procedure describes a complete replacement of all primary and secondary transformer coils. Adapt the procedure for the specific coils you may be replacing.

1. Apply a coating of Lincoln Electric E2547 Epoxy Mix along both sides of the bottom iron (lamination) assembly in the areas where the coil sides will be mounted. Coat the areas no closer than .38 inches from the top edge of the iron. See Figure F.27, arrows. Be sure that none of the epoxy drips onto the top of the iron assembly where it will meet the top assembly.

Return to Section TOC
Return to Master TOC

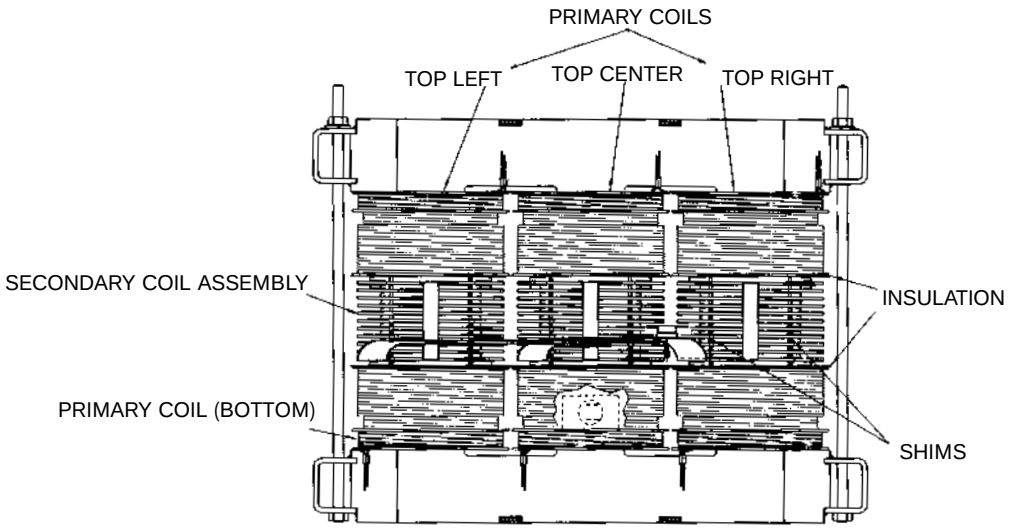
MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

FIGURE F.28 – COIL LEAD PLACEMENT



3. Install the bottom primary coils, one on each of the three legs of the bottom iron assembly. The coils must be in correct position (left, center, right). Place the coils so that the leads come out at the back of the machine. See Figure F.28 for proper positioning.
4. Place insulation (Lincoln Electric part number S20728) on top of each of the three primary coils. The longer side of the insulation should be placed toward the front of the machine. See Figure F.29 for the location of this insulation
5. Place the three secondary coils on top of the insulation installed in Step 4. The leads should come out at the front of the machine with the short leads on top. See F.28 for proper positioning.
6. Insert shims (Lincoln Electric part number CI001250 or CI000317) between the secondary coil sides and the iron assembly on either side of the legs. See Figure F.29.
7. Place insulation (Lincoln Electric part number S20728) on top of each of the three secondary coils. The longer side of the insulation should be placed toward the front of the machine, where the secondary start and finish leads come out. See Figure F.29.
8. Install the three top primary coils, noting which is right, left, and center. Leads should come out at the back of the machine. See Figure F.28 for proper positioning. The coils must be in correct position (left, center, right).
9. Install the top iron (lamination) and choke assembly. With the 9/16" deep well socket wrench, reassemble the four thru-bolts that clamp the top "E" iron to the bottom "E" iron. Lightly tap on the top of the iron with a hammer before tightening. Tighten the nuts and thru bolts to 19-25 lb-ft.

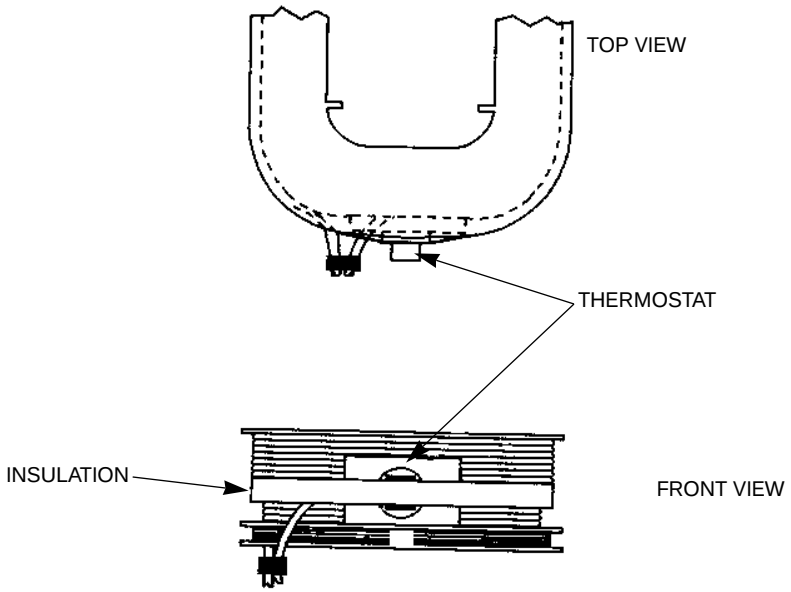
FIGURE F.29 – COIL INSULATION



Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

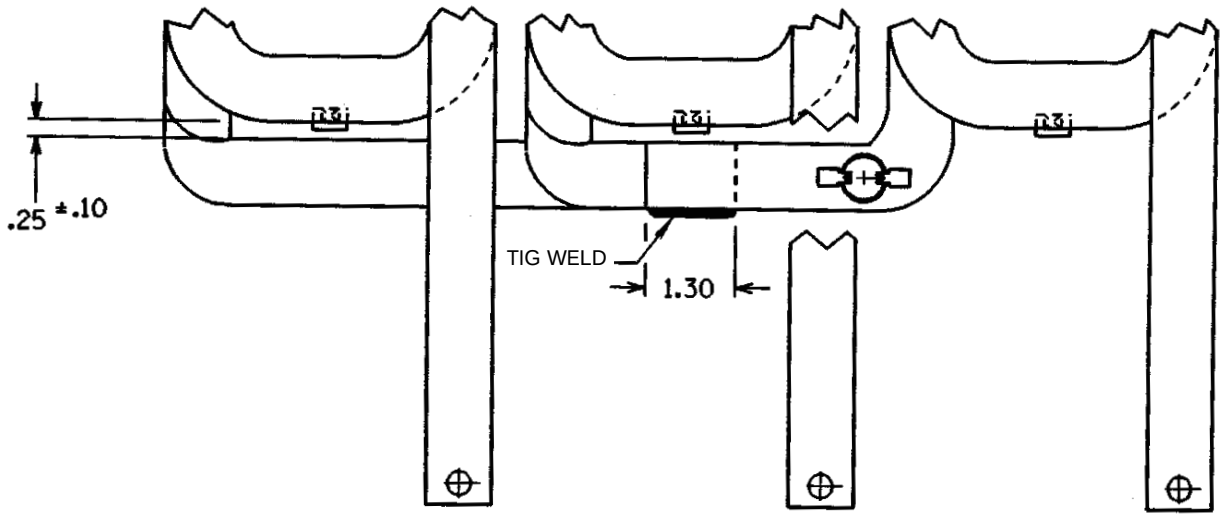
FIGURE F.30 – PRIMARY THERMOSTAT LOCATION



10. Mount the primary thermostat to the lead end coil nose. See Figure F.30. Place a small amount of Lincoln Electric E1603 Epoxy between the coil nose and the coil insulation and between the insulation and the thermostat. Hold the thermostat in place with E2381 (.375" wide) tape. If necessary, after assembly protect the thermostat terminals with E2547 terminal boots.

11. If necessary, trim off excess secondary lead stickout and TIG weld the leads together. See Figure F.31.

FIGURE F.31 – SECONDARY LEAD TRIM AND WELD DETAIL



Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

REASSEMBLING THE MAIN TRANSFORMER INTO THE MACHINE

NOTE: The following procedure assumes you have completely reassembled the transformer coils as described in the procedure above. The lower iron has remained in place in the machine. See Figures F.25 and F.26.

1. Resolder the choke control coil leads to the arc control switch.
2. Attach the bottom choke lead to the negative rectifier plate.
3. Attach the top and center choke leads to the mode selector switch.

REASSEMBLE THE LIFT BAIL

1. Carefully position the lift bail onto the machine base. Using the 9/16" socket wrench, attach the lift bail to the base of the machine with four bolts, flat washers, and lock washers.
2. Using the 9/16" socket wrench, attach the lift bail to the transformer top and bottom irons with four bolts.
3. Attach the sheet metal screw that holds the capacitor bank assembly to the case back.
4. Connect leads #204 and #227 to resistor R3.
5. Connect lead #204 to resistor R2.
6. Connect the negative capacitor strap to the mode selector switch.
7. Connect the positive capacitor strap to the output shunt.
8. Attach the two leads to resistor R1.
9. Attach the fiber baffle to the left side of the choke.
10. Attach the two fiber baffles to the left and right sides of the lift bail, adjacent to the main transformer.
11. Install the machine case top and sides.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

RETEST AFTER REPAIR

Retest a machine:

- If it is rejected under test for any reason that requires you to remove any mechanical part which could affect the machine's electrical characteristics. OR
- If you repair or replace any electrical components.

INPUT IDLE AMPS AND WATTS

Input volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
200/3/60	10.9	1.2
208/3/60	10.5	1.2
220/3/60	9.9	1.2
230/3/60	9.5	1.2
380/3/60	5.8	1.2
400/3/60	5.5	1.2
415/3/60	5.3	1.2
440/3/60	5.0	1.2
460/3/60	4.8	1.2
500/3/60	4.4	1.2
575/3/60	3.8	1.2
200/3/50	19.8	1.3
220/3/50	18.0	1.3
230/3/50	17.2	1.3
380/3/50	10.4	1.3
400/3/50	9.9	1.3
415/3/50	9.5	1.3
440/3/50	9.0	1.3
500/3/50	7.9	1.3

OPEN CIRCUIT VOLTAGES

Mode	Input Hertz	Open Circuit Volts
Constant Current	60	54/58
Constant Current	50	51/55
Constant Voltage (FCAW/GMAW)	60	42.5/46.5
	50	42.5/46.5
Constant Voltage (SUB ARC)	60	43.5/47.5
	50	43.5/47.5
Auxiliary Output (#31-#32)	60	114/124
Auxiliary Output (#31-#32)	50	109/119
Auxiliary Output (#41-#42)	60	43.8/47.5
Auxiliary Output (#41-#42)	50	42.0/45.6

TROUBLESHOOTING & REPAIR

RETEST AFTER REPAIR *(continued)*

MAXIMUM ACCEPTABLE OUTPUT VOLTAGE- AT MINIMUM OUPUT SETTINGS

Mode	Control Settings	Load
Constant Current	Output Control and Arc Force Control at Minimum	Under 70 Amps @ 0 to 3 Volts
Constant Voltage (FCAW/GMAW)	Output Control at Minimum	120 Amps @ 6 to 12 Volts

MINIMUM ACCEPTABLE OUTPUT VOLTAGE- AT MAXIMUM OUTPUT SETTINGS

Mode	Control Settings	Load
Constant Current	Output Control at Maximum	525 Amps @ 41.5 Volts (Min)
Constant Voltage (FCAW/GMAW)	Output Control at Maximum	525 Amps @ 41.5 Volts (Min)
Constant Voltage (SUB ARC)	Output Control at Maximum	525 Amps @ 41.5 Volts (Min)

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS
- ELECTRICAL DIAGRAMS SECTION -

Electrical Diagram Section . . . . . Section G

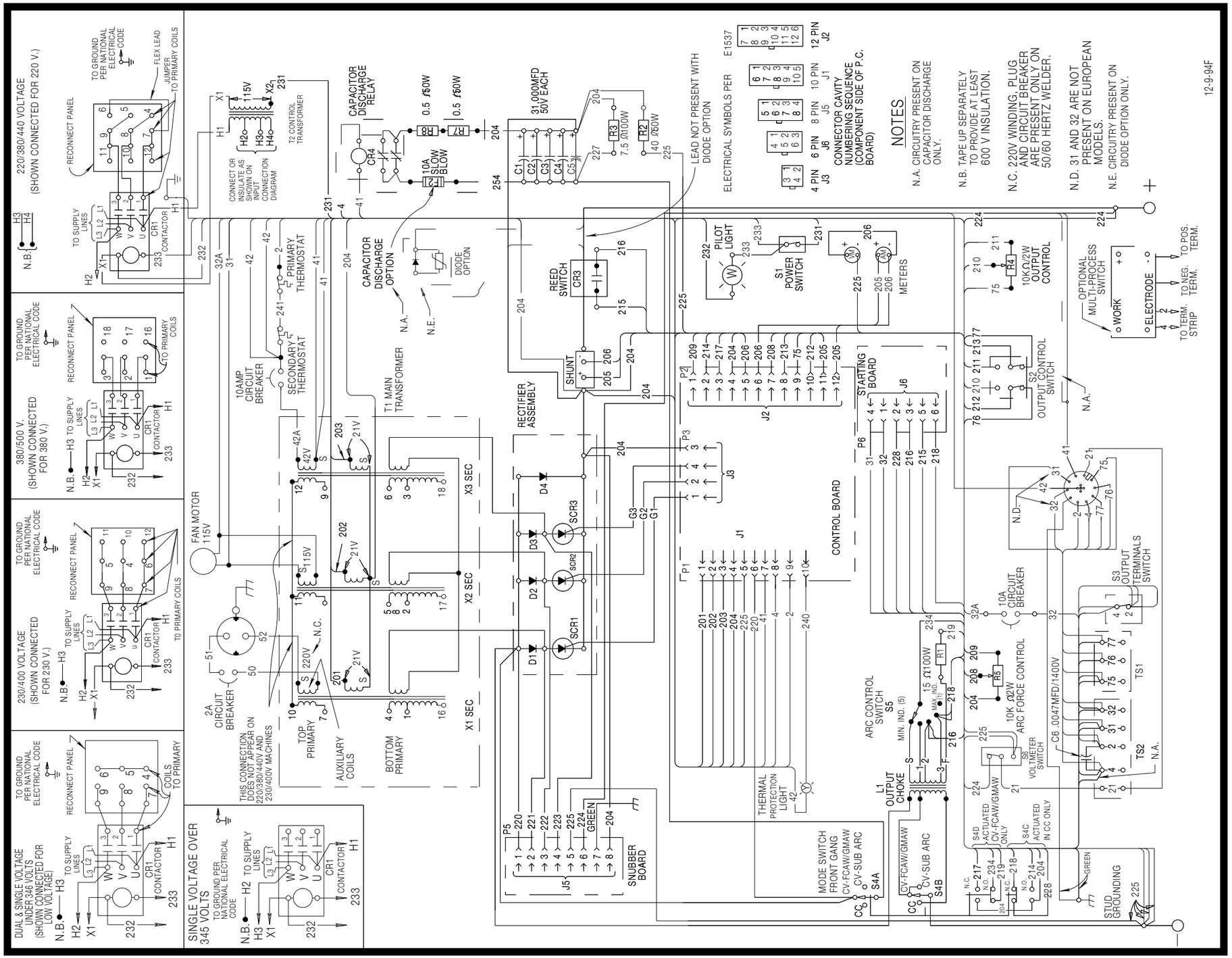
Wiring Diagram (Codes 9847, 9848) G-2
Wiring Diagram (Code 9850) G-3
Control PC Board (G2588) Layout G-4
Starting PC Board (M14520) Layout G-5
Snubber PC Board (M15370) Layout G-6
Control PC Board (G2588) Schematic G-7
Starting PC Board (M14520) Schematic G-8
Snubber PC Board (M15370) Schematic G-9

Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

NOTES

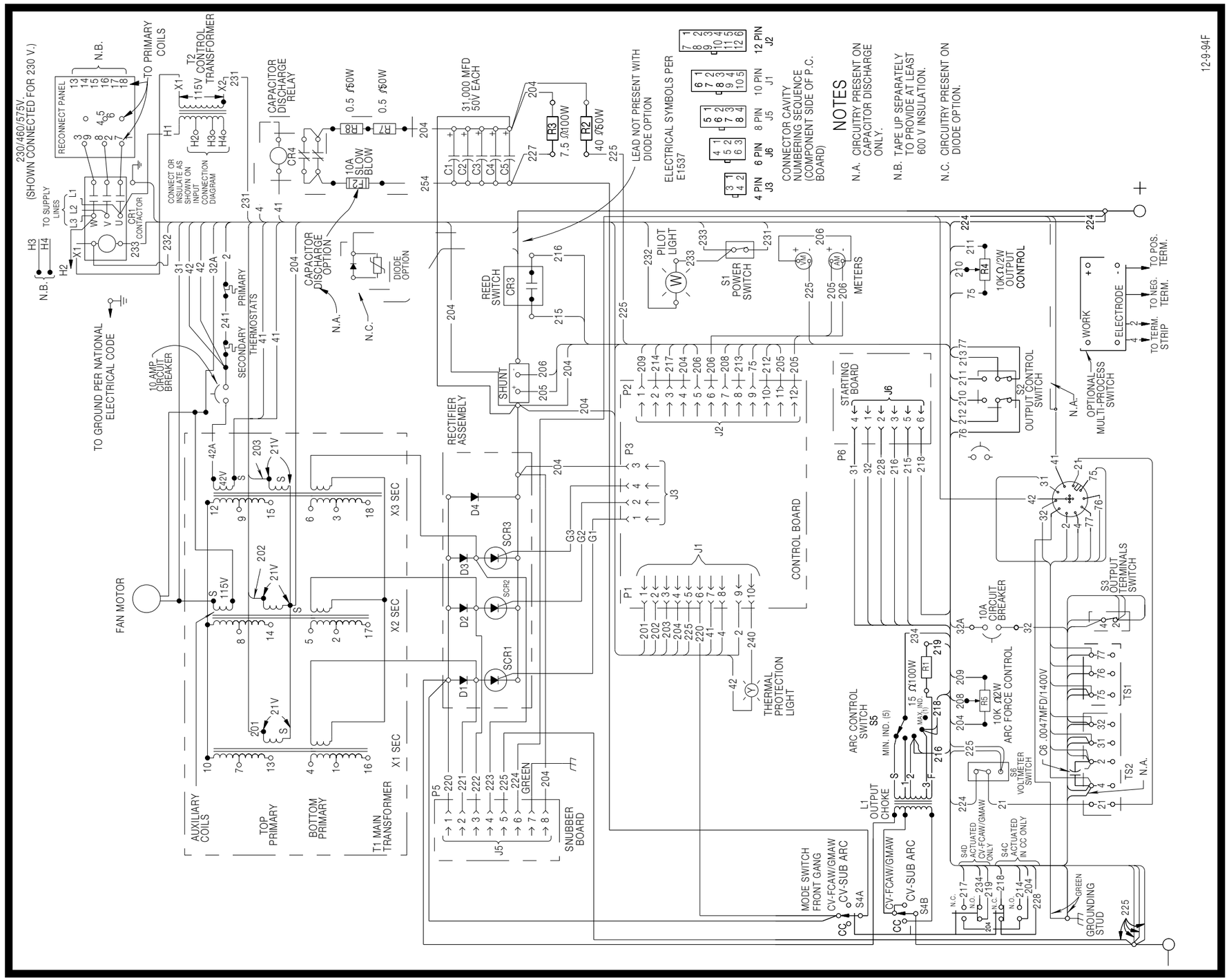
Wiring Diagram (Codes 9847, 9848)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Wiring Diagram (Code 9850)



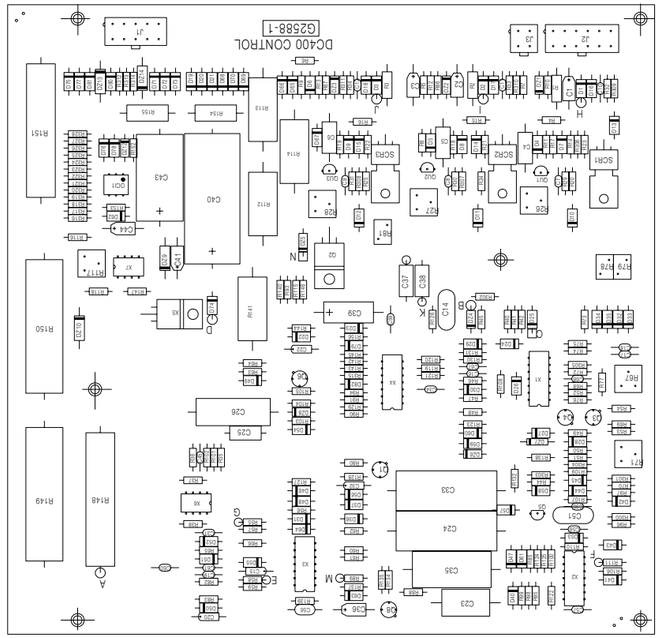
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Control PC Board (G2588) Layout

ITEM	REQ'D.	PART No.	IDENTIFICATION
C1, C2, C3, C36, C41, C44	6	S13490-25	4.7/35
C4, C5, C6	3	S13490-108	.15/100
C7, C8, C9, C10, C11, C12, C16 C17, C18, C19, C30, C31, C34, C45 C57, C58, C59, C60, C61, C67, C68	21	S16668-5	.022/50
C14, C51	2	T11577-52	.0047 or .005/1400
C15, C20, C22, C32	4	S13490-19	1.8/20
C23	1	S13490-94	.33/200
C24, C33	2	T11577-50	4.0MFD,50V CAPACITOR
C25, C37, C38	3	S13490-102	.047/100
C26	1	T11577-28	.22/100
C35	1	S13490-70	.68/50
C39	1	S13490-66	47/35
C40	1	T11577-49	500/50
C43	1	T11577-2	150/50
C56	1	S16668-11	.1/50
D1, D2, D3, D4, D5, D6, D7, D8, D9 D10, D11, D12, D13, D14, D15 D16, D17, D18, D22, D23, D24 D25, D26, D27, D28, D29, D30 D31, D32, D33, D34, D35, D36 D37, D40, D41, D42, D43, D44 D45, D46, D47, D48, D49, D50 D51, D52, D53, D54, D55, D56 D57, D58, D59, D60, D61, D62 D63, D64, D65, D66, D67, D74 D75, D76, D77, D78, D79, D80 D81, D82	71	T12199-1	IN4004
D19, D20, D21, D68, D69, D70	9	T12199-4	IN4005 DIODE
D71, D72, D73			
DZ1, DZ2, DZ3, DZ4, DZ5, DZ6	6	T12702-29	IN4744A
DZ7	1	T12702-15	IN5231B
DZ8	1	T12702-38	IN4751
DZ9	1	T12702-50	IN5354B
DZ10	1	T12702-33	IN5347B
DZ12	1	T12702-40	IN4735
DZ13	1	T12702-23	IN5352B
DZ14	1	T12702-41	IN5359B ZENER DIODE
J1	1	S18248-10	HEADER
J2	1	S18248-12	HEADER
J3	1	S18248-4	HEADER
OC1	1	S15000-10	OPTO ISOLATOR
Q1, Q3, Q4, Q6, Q8	5	T12704-36	2N4857
Q2	1	T12704-54	N-CHANNEL FET (SS)
Q5	1	T12704-68	2N4401
QU1, QU2, QU3	3	T12707-4	2N6027
R1, R2, R3	3	T14231-14	27 1/2W
R4, R5, R6, R7, R8, R9, R146	7	S19400-2671	2.67K 1/4W
R10, R35, R36, R37, R86, R87	6	S19400-4750	475 1/4W
R11, R12, R13, R29, R30, R31 R41, R42, R49, R51, R57, R59 R105, R137, R153, R315	16	S19400-1003	100K 1/4W
R14, R15, R16, R23, R24, R25, R76	7	S19400-2670	267 1/4W
R17, R18, R19, R82, R93	5	S19400-4751	4.75K
R20, R21, R22, R63	4	S19400-1001	1K 1/4W
R26, R27, R28	3	T10812-39	50K 1/2W TRIMMER
R32, R33, R34, R309, R310, R311	6	S19400-5620	562 1/4W
R38	1	S19400-24R9	24.9 1/4W
R40, R96, R108, R300, R302, R303	6	S19400-1372	13.7K 1/4W
R44, R107, R125	3	S19400-2672	26.7K 1/4W
R45, R75, R126, R127, R152	5	S19400-1000	100 1/4W
R46, R47, R48, R53, R56, R64 R68, R70, R83, R85, R91, R98 R116, R123, R138, R140, R142 R143, R144, R145, R147	21	S19400-1002	10K 1/4W
R50, R58	2	S19400-2211	2.21K 1/4W
R52, R101	2	S19400-3323	332K 1/4W
R54, R97, R109, R301, R304	5	S19400-1501	1.5K 1/4W
R55, R95, R129, R130	4	S19400-2212	22.1K 1/4W
R60	1	S19400-3011	3.01K 1/4W
R61	1	S19400-6811	6.81K 1/4W
R62, R69, R89, R99, R106, R128 R131	7	S19400-4753	475K 1/4W
R65, R88, R102, R121	4	S19400-3322	33.2K 1/4W
R66, R80, R103	3	S19400-1004	1M 1/4W
R67, R71	2	T10812-41	10K 1/2W TRIMMER
R72, R74, R104	3	S19400-2673	267K 1/4W
R73	1	S19400-3923	392K 1/4W
R77, R305	2	S19400-7500	750 1/4W
R78, R79, R81	3	S18380-1	PTC THERMISTOR
R90, R94, R134, R139	4	S19400-1502	15K 1/4W
R100, R119	2	S19400-1023	102K 1/4W
R110	1	S19400-5621	5.62K 1/4W
R111	1	S19400-4752	47.5K 1/4W
R112, R113, R114	3	T14648-18	68 5W
R115	1	S19400-1821	1.82K 1/4W
R117	1	T10812-73	2K 1/2W TRIMMER
R118	1	S19400-3162	31.6K 1/4W
R120	1	S19400-5112	51.1K 1/4W
R122	1	S19400-6192	61.9K
R124, R316, R317, R318, R319 R320, R321, R322, R323, R324 R325, R326, R327, R328	14	S19400-6812	68.1K 1/4W
R132	1	S19400-8252	82.5K 1/4W
R135, R156	2	S19400-2213	221K 1/4W
R141	1	T14648-19	1K 5W
R148	1	T12300-68	250 10W
R149, R150	2	T14650-1	1500 OHMS, 15 WATT
R151	1	T14649-11	160/10W
R154, R155	2	T12732-10	2.7 1W
R306, R307, R308	3	S19400-2000	200 1/4W
R312, R313, R314	3	S19400-2430	243 1/4W
SCR1, SCR2, SCR3	3	S15161-19	4A., 400V. SCR
X1, X2, X3, X4	4	S15128-4	LM224 OP-AMP
X5	1	S15128-5	+5V REG.
X6	1	S15128-20	AMPLIFIER
X7	1	S15128-10	VOLTAGE REF.

IDEALARC DC-400
CONTROL P.C. BOARD ASSEMBLY
REF. NO. **G** 2588-1

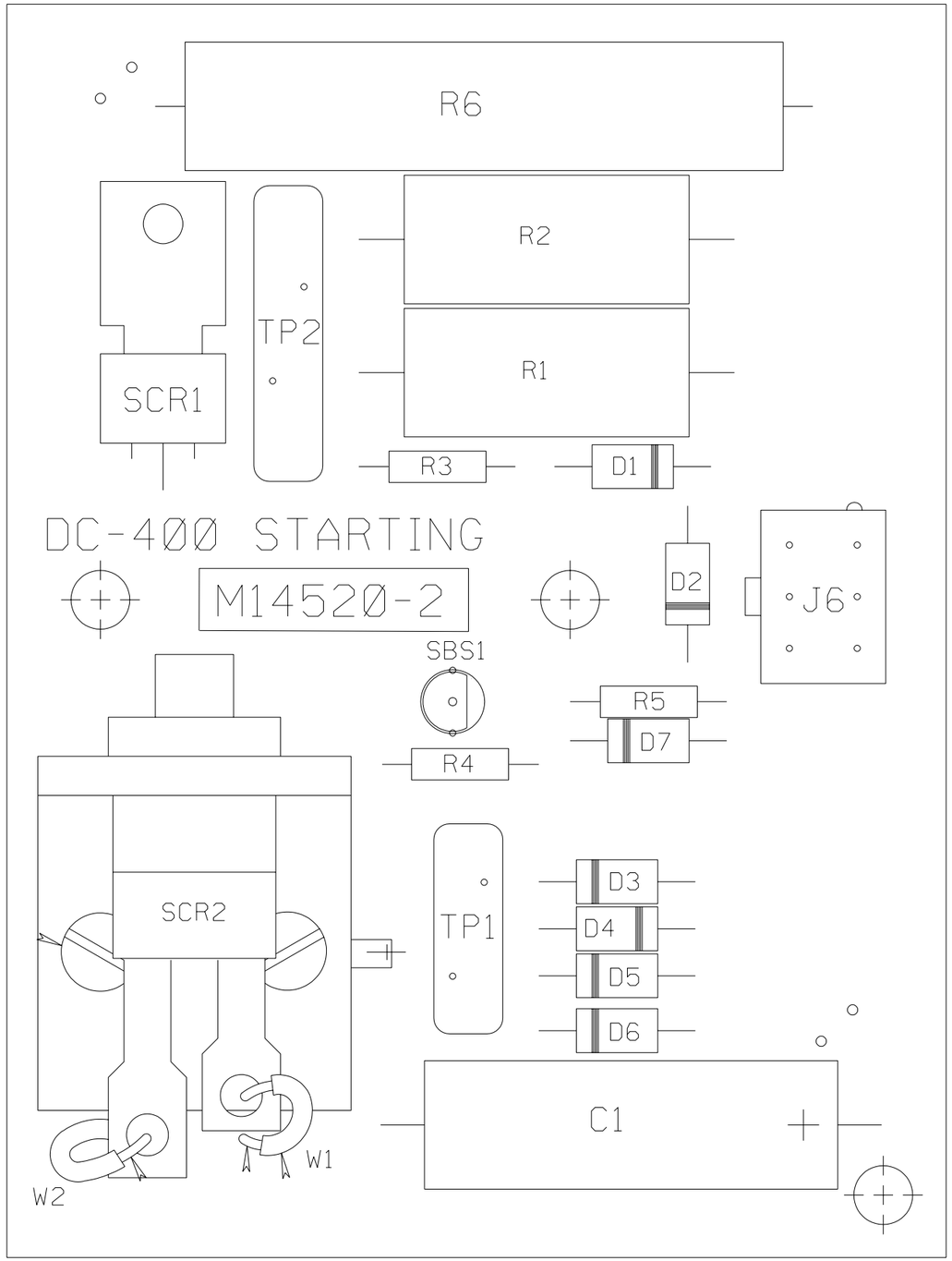


NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

Starting PC Board (M14520) Layout

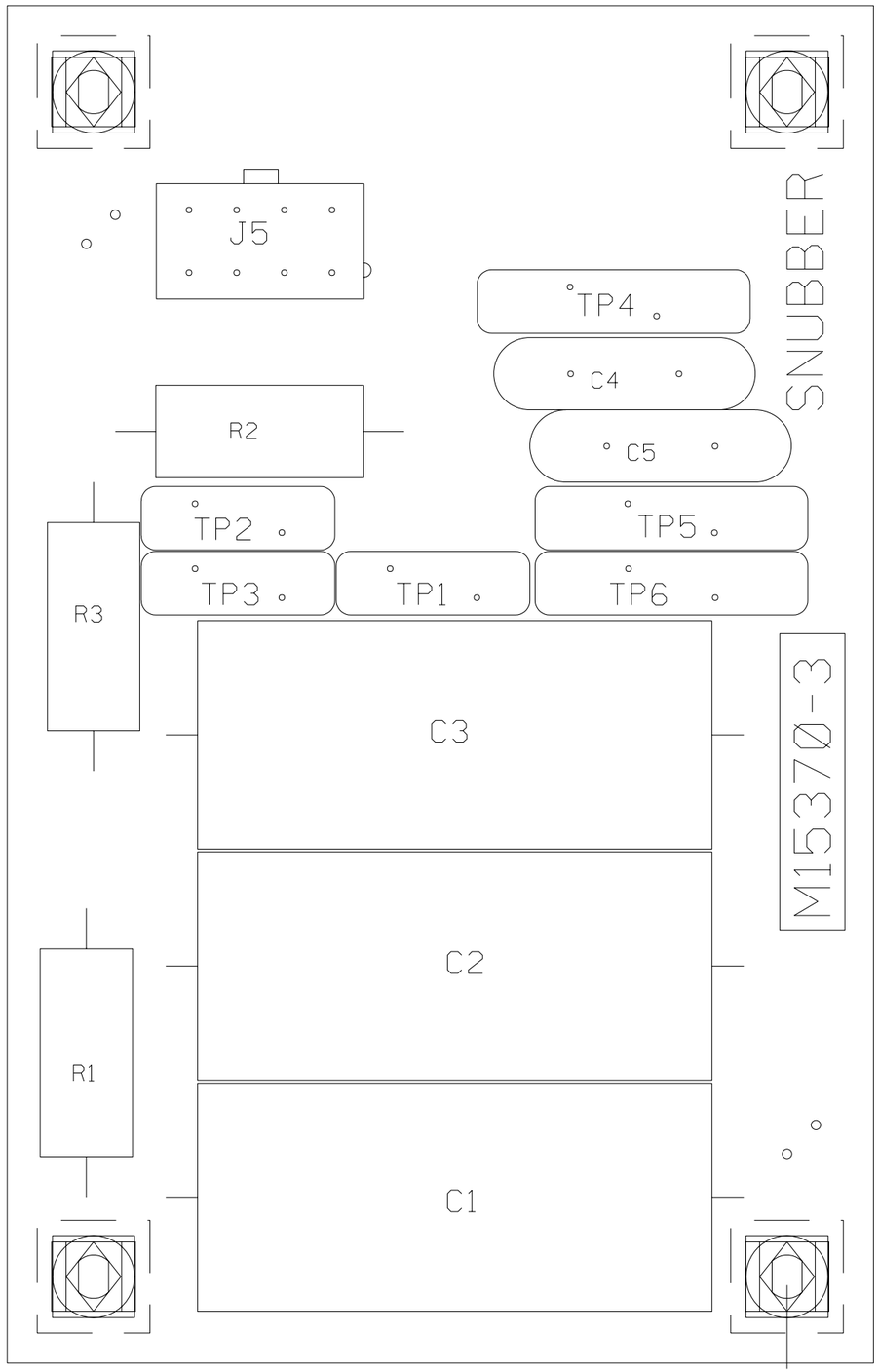


ITEM	REQ'D	IDENTIFICATION
C1	1	50/50
D1, D2	2	1N4007
D3, D4, D5, D6, D7	5	1N4004
R1, R2	2	5W/2500 OHM RESISTOR
R3, R5	2	1K 1/4W
R4	1	1.5K 1/4W
R6	1	100 10W
SCR1	1	4A, 400V SCR
SCR2	1	SCR HEAT SINK AS'BLY
SBS1	1	SILICON BILATERAL SWITCH
TP1	1	38J
TP2	1	160J

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC

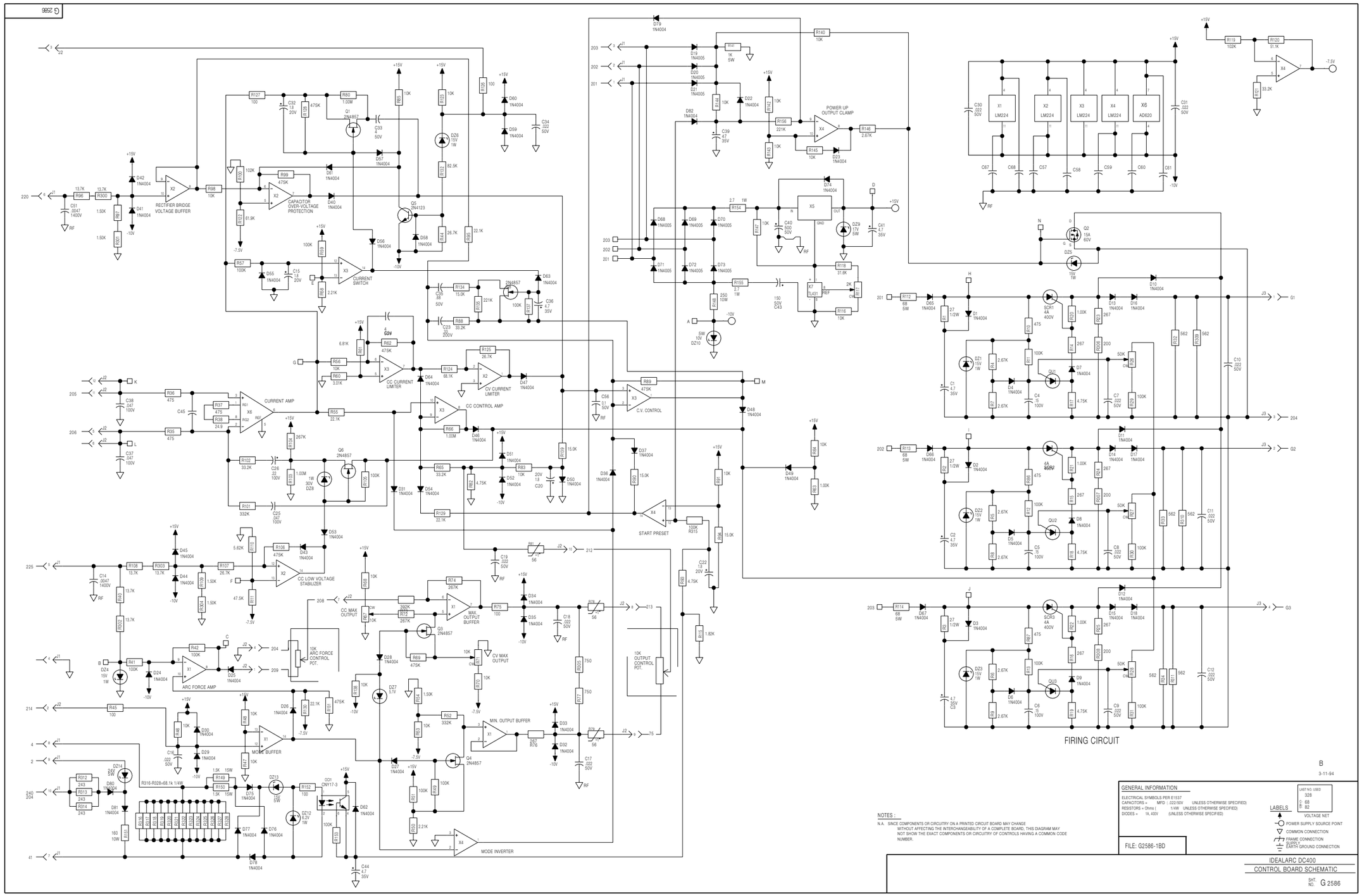
Snubber PC Board (M15370) Layout



ITEM	REQD	DESCRIPTION
C1,C2,C3	3	.68/400
C4,C5	2	.05/600
R1,R2,R3	3	10 2W
TP1,TP2,TP3	3	38J
TP4,TP5	2	160J
TP6	1	80J

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Control PC Board (G2588) Schematic



NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC

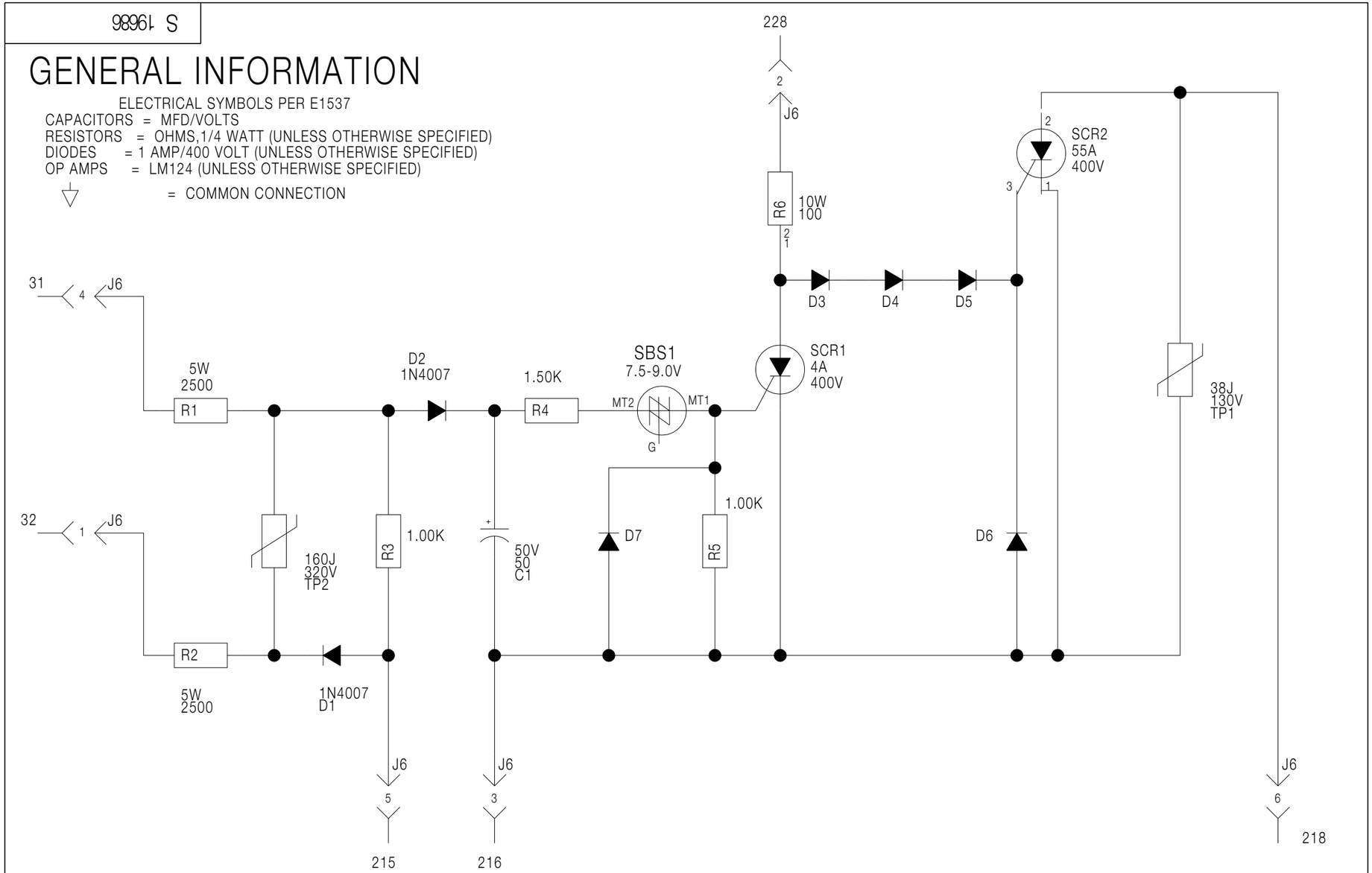
Return to Section TOC
Return to Master TOC

Starting PC Board (M14520) Schematic

S 19686

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD/VOLTS
RESISTORS = OHMS,1/4 WATT (UNLESS OTHERWISE SPECIFIED)
DIODES = 1 AMP/400 VOLT (UNLESS OTHERWISE SPECIFIED)
OP AMPS = LM124 (UNLESS OTHERWISE SPECIFIED)
= COMMON CONNECTION



	11-17-95G			

IDEALARC DC400
START SCHEMATIC
S 19686

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

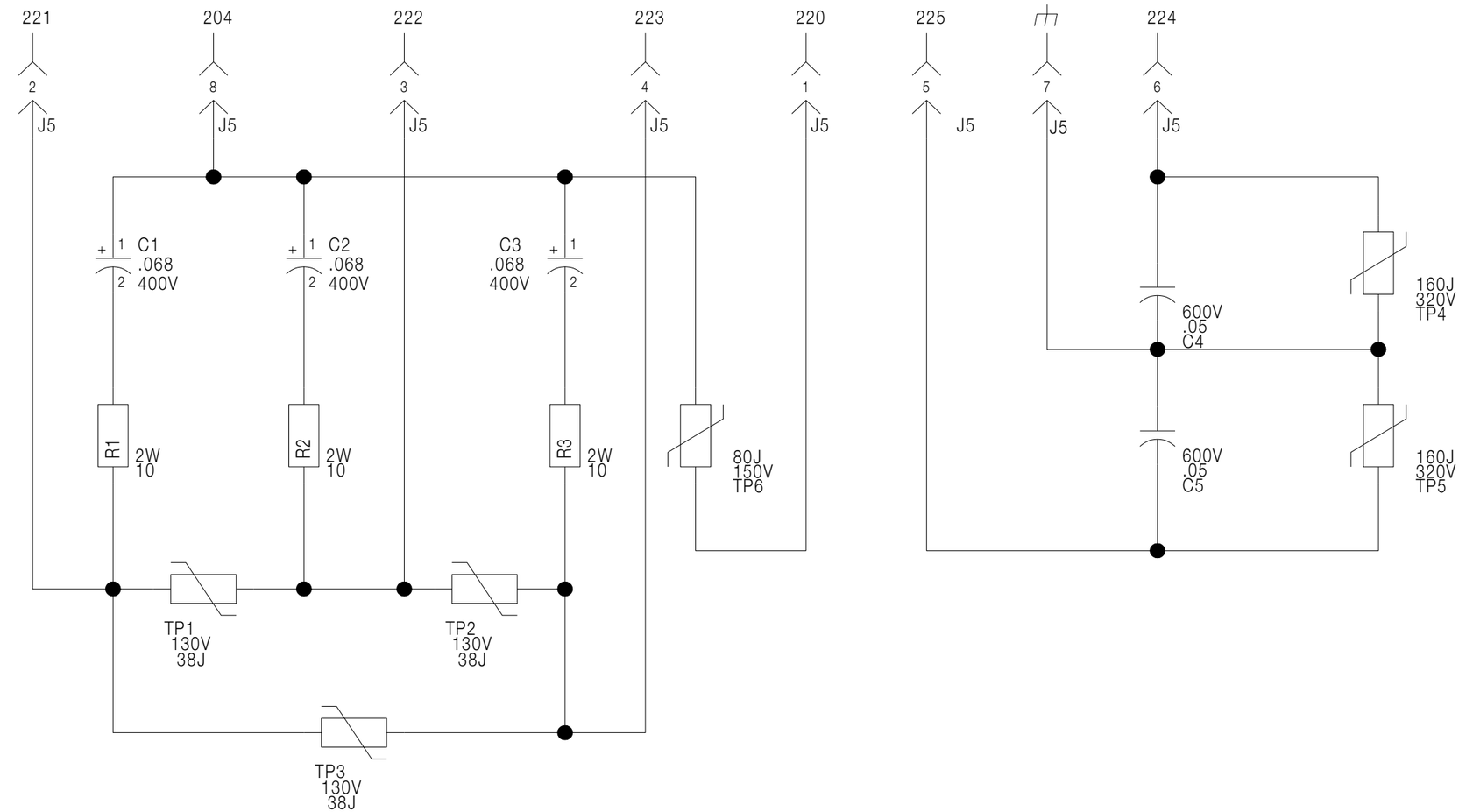
Snubber PC Board (M15370) Schematic

S 19687

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537

CAPACITORS	=	MFD/VOLTS
RESISTORS	=	OHMS,1/4 WATT (UNLESS OTHERWISE SPECIFIED)
DIODES	=	1 AMP/400 VOLT (UNLESS OTHERWISE SPECIFIED)
OP AMPS	=	LM124 (UNLESS OTHERWISE SPECIFIED)
▽	=	COMMON CONNECTION



3-8-91G				

MISC. USE

SNUBBER SCHEMATIC

S 19687

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC